PROCEEDINGS
OF THE
ROYAL SOCIETY OF MEDICINE

Vol. 45 No. 3 March 1952

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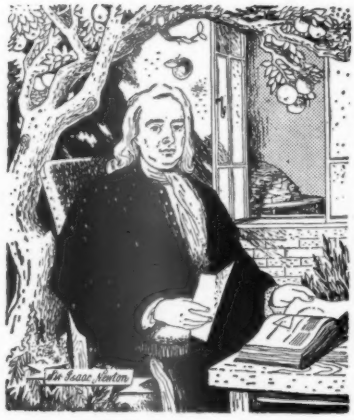

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Proceedings of the Royal Society of Medicine

Vol. 45
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Section of Dermatology

President—G. B. DOWLING M.D., F.R.C.P.

[*November* 15, 1951]

Sclerosing Lipogranuloma.—S. T. ANNING, M.D.

Male, aged 64, a retired electrical engineer (referred by Mr. P. J. Moir). For several years he has suffered from tightness of the prepuce with a little difficulty in micturition. In January 1951, a painless lump appeared in the shaft of the penis, which slowly increased in size. No history of injury, or of injection, or of taking drugs. In May 1951 the prepuce was slit and a biopsy done.

Past history.—None of note.

Family history.—None of skin disease, diabetes or tuberculosis.

On examination.—A thick plaque is present in the dorsum of the penis about 12 × 6 cm. in size attached to the skin and covered by normal epidermis. It is firm in consistency with a well-defined margin and is not tender on palpation. In the scrotum, just inferior to the base of the penis on either side, are two indurated swellings each about 1 cm. diam. Around the urethral meatus, which is narrowed and eccentric, the changes resemble balanitis xerotica obliterans. The skin elsewhere is normal. Testes normal. Slight enlargement of inguinal glands. Blood pressure 180/100. General examination (including rectum) otherwise not noteworthy.

Investigations.—W.R. negative. Blood picture normal. E.S.R. 24 mm./1 hr. (Westergren).

Skiagrams of lungs and hand bones showed nothing of note. Intravenous pyelography showed nothing abnormal.

Histological examination.—A granulomatous reaction. The superficial corium is densely infiltrated by cells, follicularly arranged, with abundant, often vacuolated cytoplasm and oval vesicular nuclei. Similar discrete follicles patchily infiltrated by lymphoctyes and plasma cells lie in the deeper corium and subcutis. Altered fatty-tissue shows a widespread necrosis and œdema. The collagen shows hyaline changes.

Comment.—The condition appears similar to that described by Smetana, H. F., and Bernhard, W. (1950, *Arch. Path.*, **50**, 296), as sclerosing lipogranuloma.

Progress.—During the last five months the swelling has not altered. He has occasional difficulty in micturition with the tight urethral meatus, but does not wish for treatment.

Dr. F. F. Hellier: We have recently seen 2 cases of a similar type. One was a man with the deep type of scleroderma with extensive plaques on the legs and thighs which had been present for many years without altering materially. On re-examining his histological sections we found a picture exactly like the case under discussion. There were large vacuolated spaces through the dermis, reaching right up to the epidermis, with the same curious hyaline changes in the collagen. The other case was recently shown at a clinical meeting by Dr. A. J. E. Barlow of Huddersfield and also showed deep sclerodermatous plaques and similar histological appearances. I feel these cases must be distinguished from ordinary scleroderma and it is possible that cases may have been overlooked because no biopsy has been taken. The chronicity of the lesion is easily explained by the enormous globules of fat, as it is difficult to see how these could be absorbed once they have formed. The only possible treatment would be complete excision.

Dr. H. Haber: Peyronie's disease, also called plastic induration of the penis, is a fibrotic process affecting the corpora cavernosa of the penis. The condition under discussion is a process involving the midcutis and subcutis. It is interesting to note that although the subcutis of the penis never contains fat cells, yet a lipogranuloma developed. There is a resemblance to paraffinoma demonstrable in that it shows a "Swiss cheese appearance" but on closer inspection one can see the oildrops surrounded by an ectoplasm with an eccentrically situated flat nucleus. Some drops, however, are surrounded by histiocytes. I have seen a similar picture in scleroderma, where there was a marked increase of connective tissue engulfing isolated islands of fat cells from the subcutis.

Dr. Brian Russell: In 1949 I showed a patient with paraffinomata of the arms (*Proceedings*, **43**, 394) and the somewhat morphœa-like picture resembled that of this patient's lesion making allowance for the differences due to situation.

The President: Has any suggestion about the pathogenesis of these cases been made? I would be interested to know how fat has appeared in a site where normally there is none.

Dr. Anning: Apart from the history of trauma in 3 of the 14 patients reported by Smetana and Bernhard, there seems to be no known cause for the condition. I have gone into the question of injury and the possibility of injection and I feel that with this particular patient it would be most unlikely that he had either injected himself or been injected by somebody else. It seems to me that short of further biopsy and staining of fat we cannot clear up that point.

Recurrent Phagedænic Ulcers.—I. B. SNEDDON, M.B., M.R.C.P.

W. B., aged 52, a bricklayer's labourer, was admitted to the surgical wards of the Sheffield Royal Infirmary in August 1948 with acute abdominal pain. He gave a history of recurrent dyspepsia for thirty years. Two weeks before admission he had developed acute abdominal pain and pyrexia. A tentative diagnosis of basal pneumonia was made but a chest radiograph showed no evidence of this.

Family history.—Nothing relevant.

Previous history.—Duodenal ulcer proved by barium meal twenty-five years ago.

Three weeks after admission several tender indurated nodules appeared on the shins, thighs and left arm. The skin over these became purple and later ulcerated, leaving a ragged necrotic centre. The ulcers continued to extend for many months despite numerous local applications and parenteral penicillin and streptomycin. In February 1950 the ulcers had healed leaving papery scars. In July 1950 fresh necrotic areas appeared on the legs and in the old scars on the thighs. Treatment with diathermy in September 1950 had no beneficial effect.

In December 1950 Chloromycetin 250 mg. three-hourly was given. Within a few days the ulcers began to heal and six weeks later the ulcers had almost healed. The Chloromycetin was stopped and the ulcers again began to extend. In February 1951 Chloromycetin was re-started with immediate improvement in the ulcers, which were completely healed a month later.

He remained well until October 1951 when two ulcers appeared on the shins. These are responding to further Chloromycetin.

On examination.—There are extensive irregular scars on the left arm, the front of both thighs and the shins. A ragged and granulomatous ulcer is present on each shin. The margins of the ulcers are raised and necrotic. General physical examination has revealed no abnormality.

Investigations.—Histology: Sections from the edge of the ulcers on two occasions have shown only necrosis and infiltration with polymorphonuclear leucocytes. No evidence of polyarteritis nodosa.

Bacteriology: Cultures from the original unbroken nodules and intact pustules which have appeared since were sterile. A penicillin-sensitive *Staphylococcus aureus* has been obtained on many occasions from the ulcerated areas and recently *B. coli* has also been isolated.

No anaerobic organisms or fungi have been found. Blood Wassermann negative. Mantoux test 1/1,000 positive. The white cell count has varied between 8,000–14,000 with a polymorphonuclear leucocytosis. The red cell count has shown no abnormality.

Radiograph of the legs has shown irregularity of the medullary cavity and localized areas of increased calcification in the tibiæ.

Comment.—The majority of chronic gangrenous ulcers previously recorded have been of the type described by Meleney (1933) as progressive bacterial synergistic gangrene and have started from the site of an operation or from a traumatic lesion, such as in the case shown here by Wallace in 1946, or they have been associated with ulcerative colitis or other debilitating disease. Russell (1950) reviewed the literature on pyoderma in ulcerative colitis, and noted that 6 out of 32 cases started with erythema nodosum-like lesions. There has been no evidence of ulcerative colitis in this case.

Whittle (1945) showed a case of chronic multiple ulcers of twenty-five years' duration in a man of 60 who appeared to be in good health. The only organisms found were staphylococci and anaerobic streptococci. Hicks (1950) reported a case of a single ulcer under the title "Ulcus Migrans" which occurred in a man of 20 who, however, also had acne indurata.

In the present case, the onset with fever and abdominal pain and the numerous sterile cultures from the early lesions suggested that the ulceration might be due to a systemic disease such as polyarteritis nodosa. However, the lesions have remained confined to the skin and he has shown no evidence of polyarteritis in any internal organs. In chronic ulceration artefact has always to be considered, but these ulcers have been watched from their earliest days and have failed to improve with occlusive dressings, so that artefact can be definitely excluded. There has been no evidence that the ulcers are tuberculous and of the type reported by van den Meer in 1950. It appears that this type of ulceration is a peculiar individual reaction to a common organism, such as a staphylococcus, rather than an infection with a rare organism.

The response to Chloromycetin on three occasions suggests that either it is controlling the infection with staphylococci, which have latterly been present in large numbers, or that it is having some specific effect in promoting healing which is not possessed by the other antibiotics that have been used, even though the organisms were sensitive to them *in vitro*.

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Dr. Brian Russell: In phagedænic ulceration occurring with ulcerative colitis the ulcers only develop when the patient is *in extremis* after a severe bout of diarrhœa or after a massive intestinal hæmorrhage. Healing of the ulcers occurs when the diarrhœa subsides or when the blood loss is made good, unless other factors such as hypostasis or thrombosis are present. At the worst phase there is an absence of leucocytosis, often a frank leucopenia, suggesting that a bone-marrow failure secondary to the blood, salt and fluid loss is responsible for the lack of inflammatory reaction in the ulcers.

Dr. D. I. Williams: I have seen one case similar to this which followed the same course. My case had ulcers which to me looked very much like these; they healed, broke down and healed again over a period of three years. She was admitted to hospital for the last time because an enlarged liver was found and after a month she died. She had the largest tuberculomata in the liver I have ever seen. It seems that this is probably some ordinary organism flourishing in a patient unable to combat it.

Dr. C. H. Whittle: I would like to mention some points in my case referred to by Dr. Sneddon and shown here twice (Whittle, 1945, 1946). I think the ulcers were not much like the present ones. They were localized to the upper part of the body, the arms and the chest. The patient, a man, was much older—he was 60 when he presented himself—and he had had these ulcers for twenty-five years and he had not been near a doctor in that time. With such a history any question of artefact is extremely unlikely. The case failed to respond to most of the antibiotics given him. The lesions were more like tuberculous ulcers, but biopsy sections did not support this diagnosis. We were never able to find a satisfactory organism to explain them. We did recover staphylococci and, once, micro-aerophilic streptococci but they did not seem to be causative. Blastomycosis was mentioned here, special cultures were made but nothing was found. He is still coming to see us. He was recently given Chloromycetin and it had not the slightest effect. These chronic ulcers give rise to little ill-health and may be unassociated with any systemic changes.

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Dr. Oliver Scott: Although it does not contribute to our knowledge of the cause of this condition, I suggest treatment by the amniotic "graft" technique described by Troensegaard-Hansen (*Lancet*, 1950 (i), 859). By this method leg ulcers of many different causes will heal when they have hitherto obstinately resisted ordinary treatment.

Sarcoidosis.—I. S. HODGSON-JONES, M.R.C.P., and C. S. NICOL, M.D.

N. M., male, aged 35, was admitted to an Observation Ward with euphoria, hallucination and fits in 1938. He was found to have a negative blood Wassermann reaction; but on the cerebrospinal fluid changes, which were: a positive Wassermann reaction, 155 cells/c.mm., and a raised globulin and Lange 2223444321, a diagnosis of dementia paralytica was made and he was treated by malarial therapy.

He was admitted to the Middlesex Hospital with epilepsy in 1949, and at that time examination showed him to have nystagmus, exaggerated jerks including jaw-jerk, and bilateral extensor plantaris response. The cerebrospinal fluid changes showed a rise in the protein and cells, and a Lange curve with a mid-zone rise. He was treated with 7 mega units of penicillin and a further 20 mega units were given a year later.

The patient's father had a urethral stricture due to gonorrhœa; however, his Wassermann reaction is negative, as is that of his brother and wife. He has one normal child. At the age of 16 years the patient ran the risk of acquiring venereal infection.

His present condition is that he has had sarcoid lesions on his face, nose and ears, for eight months and erythema nodosum on his legs which is now fading.

His fingers show fusiform swelling. His pupils are irregular and unequal, the reaction to light is sluggish, and on the right retina is an abnormality thought to be congenital.

He has nystagmus and increased deep reflexes, together with some retardation of thought.

Skin biopsy confirmed the diagnosis of sarcoidosis, the Mantoux was positive 1/1,000. X-ray examination showed osteitis tuberculosa multiplex cystoides (Jüngling) of the hands and increased markings in the bases of the lungs consistent with sarcoidosis.

The most recent cerebrospinal fluid examination still shows raised cells and protein levels.

Comments.—The diagnosis of sarcoidosis is established by the histology and further strengthened by the findings in the bones and chest.

The association with erythema nodosum has been frequently described.

The syphilis might be considered as a fortuitous association, or perhaps—by some—as ætiologically significant; or even as non-existent in this case.

The evidence that the patient may have had syphilis rests on the following points: He has had a disease which has diffusely attacked the central nervous system in a way very much resembling the classical picture of G.P.I. Hallucination, euphoria, depression and fits, together with upper motor neurone lesions and on two occasions the Wassermann reaction in the cerebrospinal fluid has been positive, although the blood Wassermann reaction has never been so; and the cerebrospinal fluid changes, the cells, raised protein and Lange would do well for syphilis.

Against this, however, is the fact that antisyphilitic treatment has failed to change the cerebrospinal fluid abnormality, which I understand is a great rarity.

The serological studies on the patient's relatives in no way support the diagnosis of congenital syphilis.

Sarcoidosis is a condition now well recognized as attacking the central nervous system (Colover, 1948), and in cases previously described the range of abnormalities produced is very wide: meningo-encephalitis, myelitis, arachnoiditis, cranial nerve palsies, and peripheral neuritis as well as personality changes.

The cerebrospinal fluid findings may be a pleocytosis, raised pressure and protein, positive Nonne and Pandy tests, and with mid-zone rises in the Lange; but never has there been recorded a positive Wassermann reaction in the fluid as far as I know.

Perhaps not too much importance should be attached to cerebrospinal fluid Wassermann reaction as being specific to syphilis in such a case; non-syphilitic conditions have, on rare occasions, been recorded as giving positive results: for example, in the cerebrospinal fluid of a case of tuberculous meningitis after treatment with streptomycin (Janbon *et al.*, 1951).

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COLOVER, J. (1948) *Brain*, **71**, 451.

JANBON, M., MOUSTARDIER, G., BERTRAND, L., and SALVAING, J. (1951) *Sem. Hôp., Paris*, **27** (VI), 381.

Dr. C. S. Nicol: When I first saw this patient he had no skin lesions of sarcoidosis but it seemed to me that the response to treatment was not typical of general paresis. I now feel that the patient never had neurosyphilis, the diagnosis of which depended on the results of the spinal fluid Wassermann tests which were originally reported as "weak positive".

In the United States, Dattner (1949) reported only 3 out of 500 cases of neurosyphilis in which spinal fluid reversal was not obtained after large doses of penicillin. In our patient the most recent spinal fluid report was over six months after a course of 20 mega units of penicillin had been administered (this might be considered a more than adequate dosage). The cell count and total protein remained abnormal. None of the 3 cases recorded by Dattner had both negative blood and spinal fluid Wassermann reactions, as this patient has now after penicillin therapy.

He had been diagnosed as having congenital general paresis but the onset of this condition at the age of 24 is rare. The alternative was that he had contracted syphilis at the age of 16 but then it would be rather early for him to develop general paresis at 24.

It appears that cell and protein changes in the spinal fluid accompanied by mental symptoms have been reported in sarcoidosis and, thus, it is possible that our patient never had neurosyphilis. It is important to realize that sarcoidosis with involvement of the nervous system can simulate neurosyphilis.

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Dr. J. Sommerville: I would suggest that a Kveim antigen test would be of some significance in this case.

Dr. D. S. Wilkinson: If the man has had sarcoidosis since 1938 it is curious that the erythema nodosum lesions should only appear this year. When they do appear with sarcoidosis they are, in the vast majority of cases, at an early stage. It is interesting that they only appeared this year together with the other skin lesions.

Dr. Peter Borrie: I recently saw a case of erythema nodosum associated with bilateral hilar enlargement, in which liver biopsy showed extensive sarcoid deposits. This widespread hepatic involvement suggested to me that the sarcoidosis was not of recent origin, in spite of the occurrence of erythema nodosum.

Dr. C. S. Nicol: I have seen two examples of a patient with undoubted syphilis developing sarcoidosis. Sarcoidosis developed after full antisyphilitic treatment. If our patient really did have neurosyphilis this is also true in his case. It will be interesting to see whether further information can be obtained from his response to treatment for sarcoidosis and whether it is possible to reverse the abnormal spinal fluid findings.

The following cases were also shown:

Urticaria Pigmentosa Verrucosa.—Dr. W. N. GOLDSMITH and Dr. G. C. WELLS.

Urticaria Pigmentosa in Brother and Sister.—Dr. D. S. WILKINSON.

Incontinentia Pigmenti (Bloch-Sulzberger) (Two Cases).—Dr. C. D. CALNAN.

(1) **Multiple Intra-epidermal Epitheliomata (Bowen's Disease).** (2) **Multiple Nævoid Basal-cell Epitheliomata.**—Dr. E. WADDINGTON.

[These cases may be published later in the *British Journal of Dermatology*.]

Section of Psychiatry

President—DESMOND CURRAN, F.R.C.P., D.P.M.

[*October* 9, 1951]

"Psychiatry Ltd." [*Abridged*]

PRESIDENT'S ADDRESS

By DESMOND CURRAN, M.B., F.R.C.P., D.P.M.

ONE of the results, if not the objective, of medical education is for doctors to judge their success, or the state of progress of any branch of medicine, against a pathological rather than a sociological criterion. Traditionally the criterion of disease is an organic pathology demonstrable in life or after death, and the problem for the doctor is to determine the pathological lesion and to control this if he can. But no pathological lesion in this traditional sense is demonstrable in a large number of patients. Medicine is therefore faced with the dilemma in these cases of either (*a*) coming to the conclusion that there is nothing wrong, which is often clearly untenable, or (*b*) of expanding its scope almost indefinitely to cover every type of maladjustment.

Where should a halt be called in an expansionist campaign? Expansionist claims are widespread and have authoritarian backing. For example, Dr. Brock Chisholm, the Director-General of the World Health Organisation, quotes with warm approval the W.H.O. definition that "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". This seems logically to imply that everybody—in this world—is sick; and illness is equated in the average mind with irresponsibility. But Dr. Brock Chisholm goes further and advocates that the "chief concern" of psychiatry should be with preventive measures and "positive health"; that the "technical guidance" needed by parents, educationalists, politicians and many others can come only from psychiatrists; and that in psychiatry lies the best hope of resolving international tensions and so preventing war.

Excluding these grandiose claims concerning the resolution of international tensions and the like and turning to what Dr. Brock Chisholm calls the "mere individual", neither doctors nor patients are likely long to be content with the bare assurance that a departure from the W.H.O. definition of health spells sickness; they will want to know the cause—the pathology; and when no organic pathology is demonstrable this is apt to be sought and found in terms of psychopathology. The difficulties of psychopathology as a cause and criterion of sickness are, however, (1) it is not objectively demonstrable (at least in the same way as is traditional pathology), and (2) in the "psychopathological" there is much that is not abnormal. If, for example, the Œdipus Situation is a normal phase of development, the persistence of a mother fixation becomes less convincing as an explanation and excuse for anti-social behaviour in later life. I remember a drunken Naval Officer, concerning whom exculpation and invaliding were advocated by a non-Naval psychiatrist on mother fixation grounds, and this is the sort of report that brings psychiatry into disrepute. As the Surgeon Rear-Admiral said "There would be no end to it if this went through".

Just as general physicians and surgeons tend to be too exclusively concerned with pathological questions (hence "social medicine" ?), so psychiatrists tend to be too exclusively concerned with psychopathological questions. I believe this preoccupation with psychopathological rather than, as I would wish to see, with clinical and prognostic criteria, is one of the reasons why psychiatric claims have got out of hand. It is not easy to prove or disprove a psychopathological interpretation, whereas a prognosis can be shown much more readily to be right or wrong.

I shall now try to illustrate the dangers of expansionism in connexion with:

(1) Crime and Criminal Responsibility

In general, medical claims seem to be (1) the sick should be regarded as medical responsibilities, (2) sickness implies irresponsibility or diminished responsibility, (3) the criterion of sickness is the demonstration of a pathology. Should, however, the demonstration of a "brain pathology", such as an abnormal EEG, of a typical epileptic type in a criminal (e.g. a swindler or better still a murderer), whose crimes disclose very clearly a capacity for rapid adaptation to altering circumstances and other features that were not consistent with epileptic confusion or automatism, modify the operation of the law? The logical consequences of this view might be disconcerting for, if immunity is inferred, preventive steps should be taken, in the same way that epileptics are now prevented from holding a driving licence. Could it seriously be proposed that the possessors of these abnormal EEGs should be prevented from entering into business contracts or in other ways be deprived of their civil rights? and if we do not do this, would we not be making an abnormal EEG a criminal asset?

The difficulties become even greater when no organic pathology is demonstrable. Thus, according to the W.H.O. definition of health, all criminals, lacking as they must complete social well-being, are necessarily sick. Crime, therefore, must be a manifestation of disease and the treatment of disease, so the argument runs, is a job for the doctor. Further, since in a sense we all have a psychopathology, this can always be adduced to back up the thesis that the criminal is a sick man and irresponsible, as in the case of the drunken Naval Officer with a mother fixation. It is to be feared that the comparable psychiatric evidence is too commonly given in the courts.

(2) Working Capacity

Again, in so far as the doctrine of positive health spreads, inefficiency like crime is necessarily rather than possibly a medical problem and, in so far as it is accepted, psychiatry will be asked to shoulder an impossible burden. Already a tendency may be observed to refer inefficients and ineffectives for medical rather than executive disposal; but of course far more common is the problem of the work-shy. The sensible view surely is that many individuals present social rather than medical problems and I submit that, after careful investigation, we can and should say, when the occasion arises, that we can find no evidence of disease, or any reason why the man should be discharged on medical grounds, even if he is inefficient, or any medical reason why he should not work, as the case may be.

In brief, we should be reasonably strict in our standard as to what constitutes sickness and our job.

(3) Selection

Are we wise as psychiatrists to stake our claims as regards positive selection? By which I mean, for example, the selection of good officers rather than the exclusion of those likely to break down? The traditional medical rôle in selection has been one of exclusion. It has not in the past been the doctor's job to choose the football eleven, but merely to express his opinion as to whether a man was or was not fit to play. If the doctor was an expert on football, however, he might reasonably be elected a member of the selection committee; but not in his professional capacity. It is important to distinguish between what we are doing in our professional capacity and what we are not so doing. Even if I could choose officers better than Brigadier Blimp, I think it would be mistaken for me to suppose this resulted from my psychiatric training and so another feather in psychiatry's cap.

Psychiatry can, however, stake a claim in the exclusion of those likely to break down, although it must at once be added that the prediction of breakdown is a remarkably difficult task. Would we not be wiser to become better at negative selection before embarking upon more ambitious projects?

Another objection to positive selection is that of professional confidence. This must surely arise in any co-operative selection procedure, such as the W.O.S.B.s of the war. It seems obvious that if we warn a candidate, like a police officer, that anything he said would be used

in evidence against him he will not speak freely. This would prevent the formation of an adequate psychiatric opinion. Whereas if the candidate is not warned and what he said confidentially is conveyed to others, a gross breach of professional confidence must arise. It seems to me that this question of professional confidence will or should permanently limit our contribution to positive selection procedures. For the above reason I believe that when giving a report to lay people on selection matters, this report should be confined to the statement that we can or cannot find any medical reason against acceptance.

(4) Psychotherapy

A "Practical Art", such as medicine, may be judged by what it can do. Psychiatric treatment is not of course synonymous with analytic psychotherapy; and this is no place to discuss the value of psychiatric treatment as a whole. But there can be no doubt that increasing numbers expect to be treated by some lengthy form of psychotherapy or analysis. I believe quite unjustified expectations have got about. We have all read repeatedly of the vistas opened by the light shed through the discoveries of Freud and of how treatment by psychotherapy had been revolutionized. The result of this propaganda has led to the widespread belief that psychotherapy *should* be able to transform an individual's personality, and that there are no limits to people's potentialities when freed from the emotional ties and entanglements rooted in their childhood.

No one, I think, doubts that psychotherapy can be of real value, but, as I see it, and as the majority of psychiatrists with whom I have worked or discussed the matter have seen it, prolonged psychotherapy or analysis is only called for, and is certainly only practicable, in a small minority of cases. Happily a very large number of patients get better without analysis, either with the aid of other measures or with no specialized aid at all. And there is another large group in which the only sensible possibility is to try to get the patients to accept their limitations with no hope of a transformation scene. The strange fact is that after all these years a convincing case for the special efficacy of analysis, as opposed to other or simpler measures, has not been made out, or if it has I should like to know where. At the same time I personally believe that a case for prolonged psychotherapy or analysis does exist in a small group, perhaps 3% of those seen by someone like myself. A real advance has been made in that psychotherapy is more widely available; but I know of no evidence that the individual results achieved by psychotherapy of any kind are any better than they were thirty or forty or more years ago. Are the results not dependent upon individual gifts rather than schools? Did Freud get better results than Forel? And who since can claim an advance on either?

I think it likely that the reason for the astonishing state of our ignorance lies in the direction of interest of many psychotherapists and particularly the analysts, which often do not seem to be clinical or prognostic, so much as solely concerned with the psychopathology. Thus, whilst interpretations abound it is remarkably difficult, or quite impossible, when reading the literature to determine what was a patient's condition before, during or after treatment. It is surely reasonable to want to know what were the disabilities the patient showed and what good was done, in addition to interpretations of the dynamics of the situation in psychopathological terms. These psychopathological preoccupations must I think be the reason why publications concerning the results of psychotherapy should be so uninformative practically.

The Remedy

To advocate a clinical approach is apt to be regarded as a reactionary desire to return to the bad old days of descriptive psychiatry before our subject had become "dynamic" (a word that deserves to be paid overtime). But clinical studies are essential for the solution of the clinical problems of diagnosis, prognosis and treatment: Who can doubt, for example, our ignorance of the natural history of many disease groups? Thus I have seen more severe obsessionals in the twenties and thirties than in the older decades. What happens to severe obsessional states as they get older? I do not know and experienced psychiatrists have been unable to tell me.

The difficulties of clinical studies are obvious; but I cannot share the view that the lack of an objective criterion, such as may be said to obtain in traditional pathological studies, makes the difficulties insuperable; and I do not believe that pathology can be replaced by psychopathology for the purposes of assessment; the analogy is false. I hold that such questions as how does the patient feel, what can he do and what do others think of him, lend themselves to reasonably definite answers that can be described intelligibly. If we do not know as much as we should like, a considerable body of psychiatric knowledge is available.

It should be clear that I am not arguing that psychiatrists know nothing and can do nothing[1] or should resemble an assembly of filleted civil servants with "pass to you" as our password. There are many potentially valuable fields of work in psychiatry and if I draw on illustrations from my own hospital, it is merely because I know this best.

Owing to the widespread incidence, the majority of psychiatric patients must necessarily be tackled by those who are not psychiatrists, and therefore the adequate instruction of medical students is of fundamental importance; nor must we forget nurses. All teaching hospitals should therefore have, quite apart from the urgent demands for treatment, a reasonably large out-patient department backed up by in-patient beds. The Board of Governors at St. George's have taken an enlightened view of psychiatry. We have, for example, been given facilities that permit us some 65 "doctor sessions" for out-patients weekly (45 for adults and 20 for children); and to show that we do believe in the value of psychotherapy, I find that we refer about 20% of our new adult cases specifically for this. The amount of treatment they receive, however, varies enormously amounting from very few to thirty interviews or more.

Turning to nurses, a new Sister Tutor who is Mentally trained has just been appointed and we hope soon to have an affiliation scheme for training with a mental hospital group. We hope that an increasing number of our excellent nurses will be attracted into mental nursing, where the need is so great. The better instruction of nurses has hitherto been held up by lack of beds, but we shall soon have some 50 in-patient beds instead of 28.

As regards students, we set little store by set lectures, holding that the average medical student learns far more from lecture demonstrations and, above all, from taking cases himself, which all must now do.

Reasonably good facilities are, however, not enough; the biggest practical step forward in the teaching of medical students would be to have a compulsory examination or at least one compulsory question in all qualifying examinations. Examinations are the only effective way of making the average student take a subject seriously.

Without claiming that psychiatry is the other half of medicine, which is absurd, the case for being examined on it is overwhelming. The public would, I think, be astonished to learn that many, and probably most, doctors can still qualify without ever having had their knowledge tested on a group of disorders that fill approximately 40% of all the beds in the country, and accounted for 25% of all invalidings from the services in the last war. Nor is the postgraduate situation any better. Thus in the five years 1946–50 inclusive, out of 136 questions set in the Membership only 3 were explicitly psychiatric.

In conclusion, when one looks at the vast fields that are unquestionably in the domain of psychiatry, and at how much still remains to be done, is it necessary, is it wise and may it not be rather premature to look for fresh fields to conquer or to fail in? Personally, I have no yearning to run the world nor do I believe I could: my own job is quite enough for me.

I have called this address "Psychiatry Ltd." I understand that a limited liability company is one in which the shareholders, should the company fail or go bankrupt, are not liable for more than they subscribe. The company I have in mind is a respectable company, a large concern with big responsibilities and with a great future before it. The shareholders are quiet, diffident, modest, sober men who have a real pride in their business. But they are vexed when others undermine the reputation of the firm by using the name to float bogus companies, with grandiose prospectuses, backed up by balance sheets that do not add up to make sense.

[1]Striking advances in treatment have been made in recent years, particularly in physical methods, e.g. E.C.T. and leucotomy.

Section of Experimental Medicine and Therapeutics

President—Professor R. A. McCance, M.D., Ph.D., F.R.C.P., F.R.S.

[*October* 9, 1951]

Aureomycin in Tropical Diseases

With Special Reference to Amœbiasis and Brucellosis

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Although Aureomycin is a recently discovered antibiotic, a considerable quantity of clinical information on its use in tropical diseases already has accumulated. Much of this data is of a preliminary nature, being reports of small series of cases studied at a time when the drug was not available in sufficient quantities to permit its use in maximal dosage. In some instances suggestions of its efficacy are limited to laboratory studies using experimental animals. But disregarding the fact that this type of data cannot settle whether or not Aureomycin will be the drug of choice for particular diseases, it is obvious that Aureomycin has a very wide range of clinical usefulness in many of the more important diseases prevalent in tropical areas. These diseases will be discussed briefly as to their response to this drug, with emphasis on amœbiasis and brucellosis.

Among the special groups of disease under consideration, Aureomycin is of value in certain of those of viral, rickettsial, bacterial, spirochætal and protozoan ætiology. Nothing is reported on effective action in that group of diseases caused by the helminths.

A tentative evaluation of Aureomycin largely based on evidence from the literature, is given in Table I. For convenience in discussing, the diseases have been classified under three headings: (1) a group in which the value of Aureomycin seems to be adequately established; (2) a group in which activity of Aureomycin has been demonstrated but not adequately proved clinically; and (3) a group in which its action appears of doubtful or no value.

(1) Among the first group are the rickettsial diseases. In these the response is particularly striking. In general, patients suffering from one of these diseases are symptomatically improved within 24 to 36 hours and are frequently afebrile in 48 to 72 hours. Relapses do not occur provided treatment is continued for 24 to 48 hours after the termination of fever. There have been, moreover, some reports of success on only 24 hours of treatment. In the choice of antibiotic for this group of rickettsial diseases, Aureomycin ranks equally with chloramphenicol.

In brucellosis, regardless of whether the infection is of the bovine, porcine or caprine variety, Aureomycin controls the acute symptoms within three to six days. In an occasional patient there is a Herxheimer-like reaction with a marked elevation of the temperature and an exacerbation of symptoms on the second or third day of treatment, but this subsides within a matter of three to six hours and does so without the necessity of stopping treatment. As will be noted in detail later, the relapse rate is high. For reasons to be discussed, one might rank the older preparations of Aureomycin as somewhat inferior to Terramycin and chloramphenicol in brucella infections.

Certain forms of amœbiasis respond readily to Aureomycin. The symptoms of amœbic dysentery are generally controlled in one to three days. Parasitic relapses, however, are frequent and its value in extra-intestinal amœbiasis is not known.

The acute symptoms of relapsing fever are rapidly controlled and the relapse rate appears to be much lower than in cases treated with penicillin. As reported by Yeo (1950) the relapses in untreated controls or in patients treated with penicillin, have been approximately 75%. The relapse rate following Aureomycin has been only 12%. From this it appears that Aureomycin is the preferred antibiotic in the treatment of relapsing fever.

Tularæmia, trachoma and actinomycosis respond readily to Aureomycin, and relapses are unreported. Although available reports are somewhat less extensive than for the preceding diseases, it appears that Aureomycin is also the drug of choice in these diseases.

(2) In the second group, Aureomycin has been shown to be active in the treatment of Q fever, but the data are conflicting. In some patients the reported response is excellent; in others, there is no evidence of response. For example, one study reports 9 failures in 26 patients while in another only one failure occurred in 16 patients.

[1]The opinions and views set forth are those of the writer and are not to be construed as reflecting the policies of the Navy Department

Aureomycin produces healing of the specific skin and mucous membrane lesions of leprosy. There is a decrease in the number of bacilli recovered from the skin or from nasal smears. The number of cases reported and the time elapsed after treatment are inadequate for satisfactory evaluation, but the initial results are encouraging and appear to parallel the response to sulphones.

There are cases of Weil's disease, pinta, yaws and tropical ulcer reported and in all the response has been considered good. The number of treated cases for each disease, however, is small and inadequate for drawing definite conclusions as to the standing of Aureomycin.

In animal experimentation, Aureomycin has been demonstrated to be of value in plague and in bartonellosis, but clinical case reports are lacking. Of particular interest is the statement that this is the first antibiotic showing activity against *Bartonella*.

TABLE I.—A CURRENT EVALUATION OF AUREOMYCIN IN TROPICAL DISEASES
DATA SUMMARIZED FROM LITERATURE

Disease	Type of trials	Response
Value Tentatively Established		
Epidemic typhus Murine typhus South African tick-bite fever Scrub typhus Brill's disease R.M. spotted fever	Human	Excellent response. No relapses
Brucellosis	Human	Good clinical response. High percentage bacteriological and clinical relapses
Amœbiasis	Human	Good clinical response in intestinal forms. Moderate parasitic relapse rate
Tularæmia	Mouse	More effective than streptomycin or Chloromycetin
	Human	Response very good in the few cases reported
Relapsing fever	Human	Rapid response. Fewer relapses than with penicillin
Trachoma	Human	Good response
Actinomycosis	Human	Good response
Of Potential Value		
Plague	Mice	Less active than streptomycin
Bartonellosis	Rats	First effective antibiotic. Few *Bartonella* persist, but no anæmia or hæmoglobinuria
Leprosy	Human	Good response. Inadequate elapsed time to evaluate. Few cases reported
Q fever	Human	Data conflicting. Response excellent in some; failure in others
Pinta	Human	Treponema disappear from lesions. Inadequate number of cases reported
Yaws	Human	Slower response than to penicillin. No serological reversal. Inadequate number of cases reported
Tropical ulcer	Human	Good response in ulcers with spirochætes and fusiform bacilli. Inadequate number of cases reported
Weil's disease	Mice	Twice as effective as penicillin
	Human	Good response. Inadequate number of cases reported
Of Doubtful or No Value		
Typhoid	Human	Failures almost uniform to date
Malaria	Human	Mild suppressive effect on parasitæmia. About one-quarter as effective as quinine
Chagas' disease	Cultures	No effect
	Mice	Severity of disease increased

(3) Aureomycin has been tried in typhoid, malaria and Chagas' disease without significant evidence of usefulness.

Amœbiasis is the only disease of protozoan ætiology in which Aureomycin is effective. Much discussion has arisen as to the mechanism of this action. On the basis of data obtained from experiments in which Aureomycin is added to culture media with growing amœbæ (Jarpa *et al.*, 1949), some authors say that Aureomycin is directly amœbicidal. Others (Bradin and Hansen, 1949) have stated that changes in the oxidation-reduction potential resulting from the death of bacteria are the cause of the apparent amœbicidal activity and that *in vivo* activity is specifically due to this action on the intestinal flora. A third group (Hewitt *et al.*, 1950) takes the middle position and points out the possibility of its combined direct action on the intestinal flora and the amœbæ themselves. Whatever the point of view, Aureomycin has been demonstrated to be effective both clinically and parasitically in patients with acute amœbic dysentery and in amœbic carriers.

Our own experience with Aureomycin in amœbiasis is limited to 3 cases of acute amœbic dysentery, and 9 cases of amœbic carriers. In the acute disease symptomatic relief is consistent and seems more rapid than with other amœbicides, with the possible exception of Terramycin (Duggar, 1948) which appears to be equally effective. Dysentery is controlled within two to three days, and in all cases, including carriers, the parasites disappear rapidly from the stools, generally in one to four days.

In regard to the problem of parasitic relapse, an analysis of data collected from papers by various authors gives some clue to the general trend. Of 50 cases of acute amœbic dysentery treated with Aureomycin and reported by various workers, 17 relapsed. Of 182 cases of non-dysenteric or carrier types of amœbiasis, 35 relapsed. The parasitic relapse rates thus were 34% and 19%, for the two groups respectively.

Due to differences among these treatment series of dosage of Aureomycin, period of administration, and duration of follow-up, only relative significance can be attached to the figures. The interpretation is that in neither acute nor carrier states does Aureomycin represent the solution to the problem of parasitic cure.

In addition to Aureomycin's inability definitely to improve the situation with regard to parasitic relapses in intestinal amœbiasis, there arises the question of its efficacy in extra-intestinal lesions, in particular, in amœbic hepatitis or hepatic abscess. A fact that has impressed us of the importance of information on this point is the frequency in our experience with which hepatitis appears in connexion with dysentery. In a series (Killough and Magill, 1951, 1952) of 18 cases of amœbic dysentery, with only one exception, all have shown evidence of active hepatitis. 12 of these patients were treated with Terramycin, 3 with Aureomycin, and 3 with fumagillin. Among this group 3 developed signs and symptoms of an hepatic abscess while on antibiotic therapy. While actually this occurred only in cases being treated with Terramycin and fumagillin, rather than Aureomycin, the suggestion is that failures to control hepatic involvement may likewise occur with Aureomycin.

To summarize, Aureomycin is excellent for the control of the acute dysenteric symptoms of amœbiasis and with other antibiotics it may ultimately replace emetine in the management of the intestinal form of the disease; its effectiveness in extra-intestinal lesions is unknown; and lastly, parasitic relapses seem to be about as common as with some of the older amœbicides such as chiniofon and Diodoquin.

The disease in which we have had the greatest experience is brucellosis (Killough *et al.*, 1951). In the last twenty-one months, 80 cases of acute, culture-positive patients with *Brucella melitensis* have been treated. In 40 of these we have compared the relative effectiveness of Aureomycin with that of chloramphenicol and Terramycin.

The dosage of Aureomycin and chloramphenicol was 50 mg./kg./day and the dosage of Terramycin was 75 mg./kg./day except for one patient who received 100 mg./kg./day. All drugs were given on a four-hourly schedule. 11 patients were treated with Aureomycin; 13 with chloramphenicol and 16 with Terramycin. The average number of days of treatment with each antibiotic ranged from 11 days to 14 days. Fig. 1 illustrates a typical response to Aureomycin.

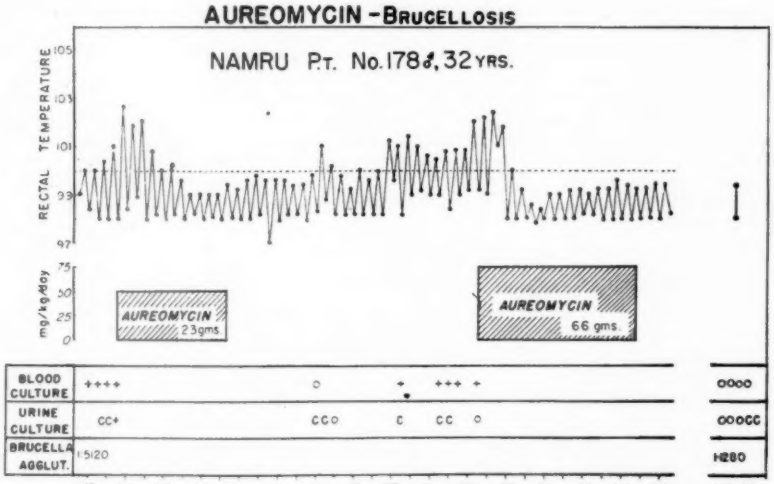

FIG. 1.—Illustrating a typical response of brucellosis to Aureomycin.

The similarity of response to the three antibiotics was striking. The average duration of fever following the start of treatment was five days with Aureomycin and chloramphenicol and three and a half days with Terramycin. Symptoms such as headache and arthralgia responded with almost equal rapidity. Follow-ups over periods of one to six months after the termination of treatment gave closely equivalent relapse rates with each of the three drugs, i.e. in the range of 70% (Table II). It

TABLE II.—RELAPSES FOLLOWING COMPLETION OF THERAPY IN CASES OF BRUCELLOSIS

Drug	No. of cases treated	Clinical* Number	Clinical* Per cent	Bacterial† Number	Bacterial† Per cent	Total Number	Total Per cent
Aureomycin ..	11	4	36	4	36	8	73
Chloramphenicol	12	6	50	2	17	8	66
Terramycin ..	16	8	50	3	19	11	69
Total	39	18	46	9	23	27	69

*Clinical relapses with or without bacterial confirmation.
†Bacterial relapses without clinical signs or symptoms.

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should be noted that one-third of the relapses in this study were not clinically overt but were discovered through blood cultures taken during routine bacteriological follow-ups. The frequency of these asymptomatic, bacteriological relapses combined with the clinical relapses have resulted in our reporting the highest relapse rate so far observed in any significant number of patients. This situation demonstrates that although the immediate clinical response is excellent with these antibiotics, the matter of bacteriological cures leaves much to be desired.

To reduce this relapse rate we have subsequently intensified treatment and tried new combinations of antibiotics. In these trials, however, Aureomycin has not been used because of its side-effects. With chloramphenicol and Terramycin, patients, even during continued administration of the drug, have shown significant increases in weight soon after the temperature had returned to normal. Such was not true with Aureomycin. Patients either just maintained their weight or actually lost. Out of 11 patients on Aureomycin, 9 showed slight to severe gastro-intestinal irritation. In none was it necessary to discontinue Aureomycin, but there were many complaints and nursing problems.

Since these studies, the new highly purified crystalline Aureomycin has become available. We are now using this preparation, and it appears to lack the undesirable side-effects previously noted. Two groups of 5 patients each were given Aureomycin in a dosage (75 mg./kg./day) known to produce vomiting with the older preparation. In the group of patients on the new crystalline Aureomycin there was no vomiting although 2 complained of some loss of appetite. The other 5 all experienced vomiting and 2 refused to continue the drug beyond four days. If this improved degree of patient tolerance is found to prevail generally, the possibility of improved response on larger dosage must be investigated for many of the diseases just discussed.

CONCLUSION

It is evident that the therapeutic usefulness of Aureomycin in tropical diseases is only in the very early phases of evaluation. The need now is for further comparative trials of Aureomycin with other antibiotics, using adequate dosages within the range of tolerance and in a sufficient number of cases. Then, after adequate observation for possible relapses, one will be able to render an opinion as to Aureomycin's true potentialities.

For immediate clinical response, Aureomycin's usefulness has already been impressively demonstrated. The principal problem in certain diseases is shifting to that of relapse which is so apt to follow the very effective clinical control of the first attack. In this connexion silent bacteriological or parasitic relapses are of as great concern as the clinical relapse. In any case, one must not fall into a false sense of security which may be engendered by the successful initial response.

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Section of Epidemiology and State Medicine

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[*November* 16, 1951]

DISCUSSION ON UNDERGRADUATE TEACHING OF SOCIAL AND PREVENTIVE MEDICINE

Dr. Thomas McKeown, *Professor of Social Medicine, University of Birmingham*: There is at present no general agreement as to the place of social and preventive medicine in the undergraduate curriculum, and the subject matter, time allotted, and policy in respect of examination, vary considerably from one university to another. This is not to say that most people cannot agree on a number of topics which should be included in the syllabus, for example the organization of medical services, the work of the preventive services, and (in association with the clinical departments) consideration of the social complications of illness. But it is somehow unsatisfactory that we are unable to define the contemporary role of the subject in simple terms.

To justify a conspicuous place in the medical curriculum a subject should, I believe, satisfy one or both of two requirements: it should embrace a field of knowledge relevant to medical problems (as do anatomy and physiology); or it should train students in a practice which they will use in their later work (as does obstetrics). Both requirements were met by traditional public health teaching, which had its academic roots in bacteriology and the epidemiology of infectious disease, and its practical application in the public health services.

This justification is no longer entirely adequate. In the first place the epidemiology of infectious disease no longer provides a satisfactory academic basis for social and preventive medicine in Western countries where, in consequence of the effectiveness of preventive measures of all kinds, the problems have changed. For example, investigation of infant mortality when the rate is below 30 is no longer mainly in the field of infectious disease. Secondly, recent experience of postgraduate teaching in public health indicates that the number of medical graduates who wish to enter the field is smaller than formerly. No doubt this is attributable, at least in part, to the changes brought about by the National Health Service Act of 1946. But until the future of the preventive services is much clearer than it is to-day it seems unlikely that the number of doctors attracted by a career in public health will be greatly increased.

Our university establishments in social and preventive medicine are now on an altogether more ambitious scale than the modest departments which they replaced. They require more substantial justification, for they cost more to maintain; and they should have more that is worth saying, since they ask for more time on the curriculum in which to say it.

I believe that our main task in social medicine is the identification of an adequate academic basis for the subject; and it is on our success in this that our success in teaching finally depends. When it is shown that social medicine can solve problems which everyone will agree are worth solving, by methods which are either new or inadequately exploited, many of the present formidable teaching difficulties will disappear. If this is not done, no amount of good intention will furnish a substitute.

Professor R. H. Parry, *Medical Officer of Health, Bristol*: Much confusion would be cleared up if the medical profession could agree that the terms "public health", "preventive medicine", and "social medicine" are not synonymous. This is also the view of the members of the Committee on the Teaching of Preventive Medicine and Public Health of the American Medical Colleges, who wrote thus in their Final Report (1945, *J. Ass. Amer. med. Coll.* **20**, 3, 152): "It (i.e. the Committee)

believes that a general recognition of the fact that these (i.e. preventive medicine and public health) are not synonymous terms would be a distinct contribution to clear thinking and preciseness of expression." The problems represented by the three terms are not the same and the approach to them is from rather different viewpoints. "Public health" conveys the idea of health as a community possession and infers organized community effort to safeguard it. "Preventive medicine", although it needs knowledge of disease casualties, narrows the view to that aspect of medicine which deals with prevention of disease and its consequences; "social medicine" concentrates on the social environment, in its widest sense, which affects health adversely and it assumes the need for the treatment of social conditions as well as of the patients. The terms "preventive" and "social medicine" were brought into use, in our medical schools at least, in an attempt to stimulate clinicians to approach disease from an ætiological point of view.

In no subject in the medical curriculum is the attitude of mind of the teacher more important than in preventive medicine. Teachers of preventive medicine feel very aggrieved that their subject should be classified as "para-clinical", with all that the term infers in regard to the relative importance to the patient of prevention and treatment. Surely it must have its repercussion on the mind of the student.

After twenty-two years' close association with the problem I believe that:

(1) Whereas at the present time the medical undergraduate is taught public health, preventive and social medicine as one discipline, there are, in fact, three different aspects with three separate approaches.

(2) Whilst the teaching of the subjects mentioned should be organized and co-ordinated from one department, several teams of teachers are required to carry it out.

(3) Undergraduate teaching of these subjects should be given throughout the whole period of medical training.

(i) The anatomists and physiologists discuss the minute structure and functioning of the body. Is it not most important for a practising doctor to know how *all* the muscle nerve preparations, all ductless glands, and the brain itself react—not to electrical stimuli, but to the impulses that reach the individual from the environment at home, at work, or even in the committee room? And the time to teach this aspect is whilst the student is busy studying the anatomy and physiology of the body. The curriculum during the second and third years might read thus—human anatomy, human physiology, and normal man as a functioning unit in his environment. The future medical practitioner would thus have his attention drawn early in his training to man's habits, to his home, to his community—in fact, to man's normal environment and to man's reaction to that environment.

(ii) The medical student should become acquainted early in his training with the stimulating story of the progress of the fight for health against disease, from the social as well as the medical aspect.

(iii) No one would deny the importance and the value to any teaching department of its being also concerned with research. At the same time, the task of showing the future practitioner the right road to the clinical practice of medicine should not be sacrificed to the needs of a research programme.

(iv) During the years of his clinical training the student's attention should be directed to the social and preventive aspects of disease at the bedside. This could best be done at case conferences by a physician who has made a special study of these aspects of the particular case under discussion. This in turn should lead to a discussion of the public health problems of community groups. It is only by this approach that we can achieve worth-while integration of teaching. In this way the problems of infant mortality, of maternity, of the school child, of old age and industrial welfare, the control of infectious disease and the epidemiology of non-infectious disease may with advantage be discussed by the public health specialist whilst the students are attending clinical instruction.

I suggest the syllabus in preventive and social medicine and public health for the undergraduate medical student should include the following:

I. A study of the normal person in relation to his environment—domestic, industrial, school, &c.
II. The outstanding events of public health history.
III. Methods: The practical approach to public health problems, including the use of vital and mortal statistics, research into group problems, &c.
IV. The public health problems of special groups in the community—maternity, infants, children under 5, adolescents, old age, industry.
V. Epidemiology: infectious and non-infectious diseases.
VI. The social aspects of disease in association with bedside teaching.
VII. Course of lectures and/or discussions in the final year to assess and summarize the problems.

Such teaching should be co-ordinated from one department. A team of teachers would be needed, but each must be interested in the problem from the preventive aspect.

The problem of the build-up of a Department of Preventive Medicine is being approached in various ways. In some universities a full-time professor has been installed, some with a bias towards industrial medicine, others towards social medicine, and others towards public health. There still remain a few, old-fashioned departments where the medical officer of health is still the professor or lecturer in charge of the undergraduate training in preventive medicine. Often he is accused of being so busy with his routine work that he is unable to develop to the full his University department. I would suggest that this is not an adequate reason for destroying a well-tried organization, which we are apt to do far too often these days. Why not try to preserve what is best of the old and to build on a secure foundation? Further development can be achieved by adequate staffing. A field for research and for demonstration in public health and preventive medicine is as essential for the professor of preventive medicine as are hospital beds for the clinical professor. I am well satisfied that the best method of providing these facilities is by combining the posts of health officer and lecturer.

Dr. J. H. F. Brotherston, *London School of Hygiene and Tropical Medicine*: The primary object of medical training is to teach the medical student to be proficient in diagnosis and treatment and to provide him with an adequate scientific basis on which to build his knowledge. But the student must also learn to practise his art in the natural surroundings of the people with whose problems he must deal. Here is a dilemma of medical education in which we have a special interest. For technical reasons medical education has been withdrawn into the teaching hospital where problems of clinical pathology can be isolated from their surroundings to permit greater concentration of study. This arrangement has obvious advantages. For the student, however, the transition from the teaching hospital to practice outside may be an abrupt and harmful one. Dealing with patients in hospital where they are seen stripped of their identifying environment, may encourage an impression that the study and management of disease can be separated from that of the diseased individual and his surroundings. The future doctor should study the problems of his patients and his community in the light of environmental stresses, prevailing patterns of behaviour and belief relating to health, and the social institutions and services available to give help.

The student is familiar with the study of the pathological process in the individual, but he must also be persuaded to see problems of health and disease in larger ecological terms, as the results of interactions between human beings and their physical, biological and social environment. In this larger sense, diagnosis becomes the function of epidemiology, using the wider meaning of the word. With medical students, the objective in this part of the teaching is to arouse curiosity and interest combined with a critical approach, so that they may have some understanding of how to sort out the large problems from the small and in order that some of the associations of these problems may be seen. This gives some idea of what and where to attack in order to control and prevent. The study of treatment with this dimension added comes close to the traditional field of public health teaching. It is concerned with the control of environmental factors not only in the interest of the community but for the individual patient and his family, it relates also to specific preventive measures and to the problems of medical care. This part of the work is increasingly important as medicine becomes more and more a field of public policy. It would be ludicrous as well as unkind to send students out into a world of state medicine without telling them a little about the geography of that world.

There is another aspect which must be stressed. To diagnose correctly, and to know the appropriate treatment is not enough. The treatment must be applied to be effective. There is a problem of persuasion and education which constantly faces the doctor in practice. Medical training can result in a somewhat mechanistic outlook. Treatment may seem to follow diagnosis as night follows day. The unco-operative patient sometimes receives short shrift in hospital. Inside this little medical empire the doctor may scarcely take the time to explain. But outside hospital the new doctor will find himself in a world where the medical writ does not run. He has to practise among people who do not necessarily adopt the same process of reasoning as he does. It is worth while that the student should learn in time the need to understand the beliefs, prejudices and habits of his patients. It is useful, too, if the student can learn that he himself may carry as heavy a load of prejudices as anyone, and that these may hamper him in what he is trying to achieve for his patients.

So far as the methods of teaching are concerned, there is no blue print which outlines how the job should be done. The methods must be adjusted to each medical school. It is important to bring some of these concepts to the notice of the student before he starts his clinical training and his vision is confined within the hospital ward. Some of the teaching can be done by didactic lectures and specially arranged demonstrations, but it will lose in effect if it remains entirely peripheral to the students' clinical interest. Expedients which relate some of the teaching to the clinical work in the wards, and which bridge the gulf between that work and the outside world are valuable. From this point of view our experience with combined case conferences in the Children's Department at Guy's

Hospital has been interesting and useful. There is great advantage in being able to relate the teaching to the problems and services of a known community, but the complexity of a vast metropolitan area such as London is apt to be confusing to the student.

In conclusion it must be emphasized that we are dealing as much with attitudes as with the imparting of facts. But we do not know enough about the attitudes of medical students to their community responsibilities. The time is ripe for some study of the attitudes which the student brings with him to the medical school, and the effect upon them of his medical training.

[*December* 21, 1951]

DISCUSSION: STUDIES IN MORBIDITY IN CHILDHOOD

Dr. F. J. W. Miller, *The Children's Department, Royal Victoria Infirmary, Newcastle upon Tyne*: This meeting would surely have been blessed by William Farr, and perhaps it is not too fanciful to feel that it has some continuity with his years of endeavour and toil to demonstrate the wastage of infant life and the factors associated therewith.

No doubt our infantile mortality of 30; a death-rate of 1·5 per 1,000 young children between one and five years and of 0·6 per 1,000 at school age, would have been beyond his most optimistic expectations. But because we have reached that point in coping with the causes of death, we can begin to study and measure the causes, the incidence and the types of illness in infancy and childhood. Yet we soon realize that our knowledge of morbidity in the community is of a degree comparable with that of mortality before the registration of deaths became obligatory and the Office of the Registrar-General was established. We have certain rather inaccurate and incomplete evidence concerning a few notifiable diseases, but, so far as the infant and young child are concerned, there is no method of measuring or describing the illnesses except by prolonged and detailed observation of a proper sample group.

At present I know of only five studies designed to give this information. They have each been organized and are being conducted with emphasis on slightly different aspects of the problem, but together in a few years they should increase materially our knowledge of the illnesses of early childhood.

In America there is the detailed clinical and bacteriological investigation of fifty-seven middle-class families carried on by Dr. Dingle and his team; in England there are the studies in progress in Oxford established by the late Professor R. A. Ryle; Dr. Douglas' survey studies of nearly 14,000 children born in many different parts of England and Wales in a particular week in 1946; the survey of Professor Grundy and now of Dr. Dykes, in which the sickness experience of all the infants born in Luton during 1945 has been recorded.

Our investigation in Newcastle upon Tyne is designed to measure the frequency and describe the types of illness in infancy and early childhood. Essentially it is a clinical study of illness in a group of infants, representative of the population of the city, against the background of their social environment. Under peculiarly favourable circumstances we were able, in 1947, to enrol as a study group all infants born in Newcastle over a period of two months. Through regular and special visiting by health visitors and doctors, and the collection of other data, we have built up, episode by episode, a clinical record of each child's illnesses from 1947 to the present time. At the beginning we enrolled 1,142 families and now, after almost five years, 870 remain; 49 children have died, 8 families have withdrawn from the investigation and the remaining 215 families have removed from the city.

The survey has been organized and developed with four basic principles in mind:

(1) The investigation is designed to answer a precise question.

(2) That question is worth answering and has not hitherto been answered.

(3) The survey, involving as it does families and other doctors, must be ethically justified and sensitively carried out.

(4) The fundamental necessity is accurate clinical recording; this recording must be used in association with appropriate statistical techniques.

I shall illustrate the types of information we are collecting by reference to:

(*a*) The overall morbidity for the first year (Table I).

(*b*) The distribution of morbidity of the infectious diseases (Table II).

(*c*) The incidence of primary tuberculous infection (Table III).

(*d*) An example of a long-continued family infection.

TABLE I.—NEWCASTLE SURVEY 1947-1948

967	Children observed the whole year.
203	No recorded illness.
764	Children had 1,625 incidents of illness (mild colds, slight skin and conjunctival sepsis excluded), of which
1,393	Incidents were infective in nature.

When this morbidity is analysed into the types of infection, we find that respiratory infection is responsible for 50% of all incidents. With skin sepsis and illnesses characterized by vomiting and diarrhœa, 83% of all infective morbidity is accounted for.

TABLE II.—THE PATTERN OF INFECTIVE ILLNESS IN THE FIRST YEAR

Type of illness	Percentage of all episodes
Sharp respiratory infection	50
Skin sepsis and associated disease	22
Gastro-enteritis	11
Measles	4
Pertussis	7
Tuberculosis	0·3
Meningitis	0·3
Pink disease	0·3
Miscellaneous and unclassified	5

We were particularly anxious to study the rate of tuberculin conversion, and tuberculin jelly tests were done at six months and one year and yearly thereafter. To the present time 60 children are known to have converted. At the end of five years we shall be able to present a picture of the medical and social significance of tuberculosis in this segment of the population.

TABLE III.—TUBERCULOSIS

Age group	Tuberculin positive	Known contact	Outcome Alive	Outcome Dead
Under 6 months	3	3	2	1
6 months to 18 months	12	9	11	1
18 months to 3 years	18	13	18	0
Total	33	25	31	2

It would be possible to discuss many other diseases: pertussis, gastro-intestinal infections, staphylococcal infection; but there is one final aspect of our work which I must mention: The Family Infection

At first we were intrigued and concerned by the acute family epidemics—the acute respiratory infection sweeping through the families in an old crowded tenement; the acute alimentary infection prostrating a family within three days, affecting the aunt who came to look after them, and finally killing the kitten. But as time went on we have watched another type of family infection, the slower recurrent infections of the skin and upper respiratory tract, the former almost certainly staphylococcal in nature and the latter which appears to be due to streptococcal infection. Up to the present we have between 20 and 30 families who show this pattern of disease. The example I have chosen gives an account of incidents of recurrent streptococcal infection stretching over a period of four years in a family.

The family consists of mother, father and four children. Father suffered from chronic otorrhœa since childhood. The mother had five attacks of tonsillitis, one acute sinusitis, and finally quinsy, from July 1948 to May 1951. All the children had recurrent otorrhœa, and the aunt who joined the family in November 1950 had tonsillitis in January and May 1951.

In four years we have obtained a great store of detailed information for future work and analysis, but at the present two things are sure. First we have ourselves undergone an educative experience. We can appreciate as never before the courageous way in which the average family approaches the difficulties of life, and the way in which improvement occurs with increasing opportunity.

Secondly, we have obtained a picture of disease in infancy and in childhood which could not have been obtained in any other way, which has enlarged our understanding and given us the data to teach our students more effectively.

Dr. R. M. Dykes, *Medical Officer of Health, Luton*: The Luton study of morbidity in childhood is an enquiry, extending over the first five years of life, into the sickness experience of all infants born in 1945 whose birth was registered in the Borough (Grundy, 1949). The infant cohort initially totalled 1,897 but losses reduced this number at the end of the first year of life to 1,498—there were 49 infant deaths and 350 who left the district. The magnitude of this loss was, of course, due to the fact that the year 1945 was one during which a post-war resettlement was taking place on a large scale. During subsequent years the losses were much smaller and at the conclusion of the five-year survey there remained 1,288 children.

The analysis of the survey material of the five-year study is not yet completed and, at present, it is possible only to give the conclusions for the first year of life. It is hoped, however, to be able to publish the results of the completed survey some time next year.

For the first year of life the survey provided two main conclusions:

(1) There is a social class gradient for infant mortality.

(2) There is no social class gradient for infant morbidity, nor is there a gradient for any index other than social class.

The fact that there was no infant morbidity gradient in Luton where the environment is relatively favourable does not necessarily mean that it would also hold true for other towns less favourably circumstanced, or for the country as a whole. Indeed it would be rather remarkable if a national survey of infant morbidity failed to reveal a social class gradient. Social class differences may well be effective in less favoured areas where other factors come into play and so determine whether an illness would become serious or not.

The Luton study started first with broad issues and gave general lines for investigation. At the outset no one could have foretold what the answers were going to be and consequently it would have been impossible for anyone to say in advance what subsequent lines of enquiry should be followed. It was only when the answers to the broad questions had been obtained that it became possible to proceed to the closer study of a small number of infants within the total survey group and from there to a study of infant mortality.

A survey requiring this degree of flexibility could, of course, only be conducted in a relatively small department operating locally; and because the Luton survey is essentially a local pioneer study it is not without its imperfections. We do not feel, however, that these imperfections weaken the validity of our conclusions—an opinion to which not everyone subscribes. Thus, it has been claimed that the great loss of infants sustained during the first year has resulted in an overweighting of the number of infants in social classes IV and V (Douglas, 1951). Had our findings revealed a social class gradient then an overweighting of the population in the lower social groups would have been a serious matter. For it could have been argued, had there been no overweighting in social classes IV and V, there would have been no morbidity gradient. The fact that we found no gradient even in the sample said to be overweighted with social classes IV and V strengthens rather than weakens our conclusions.

It has also been suggested that the pooling of social class III with social classes I and II and social class IV with class V may have masked any morbidity gradient which might otherwise be present (Douglas, 1951). But a mortality gradient of 1 to 2·6 for these two groups at 4–52 weeks was shown to exist (Dykes, 1950). It does not, therefore, seem reasonable to argue that two groups with such a mortality gradient could virtually be of the same social classification. And, moreover, no morbidity gradient was revealed in any of the indices other than social class.

Social class is not by itself significant; it is important only because of what it connotes. It is, after all, merely an arbitrary fragmentation of the community into a number of groups and is employed according to certain assumptions, e.g. that a certain social class denotes a certain standard of income level and a certain standard of physical environment. This may have been truer in the past than it is to-day. Indeed, an enquiry into the average weekly wage-earning capacity of the principal occupational groups in Luton showed that whilst there was some gradation of income level as between the social classes, there was also a considerable overlapping of one group with another; and in addition, what is probably even more important, it showed that there was little evidence of any serious poverty in the Borough. This immediately raises the question of whether effective environmental differences tend to disappear if all are raised above a certain income level even though there are still wide differences in income above that level.

The failure to demonstrate by any index a morbidity gradient for infant sickness caused us to fall back on differences in infant constitution as being the only possible explanation of a high concentration of illness in a small group of the infant population—a conclusion which, I may say, was adopted with reluctance. But there is, nevertheless, evidence to suggest that for some diseases, at all events, a standard of general environmental amenity may have been reached in certain parts of the country such that sickness is mainly determined by a constitutional factor. This is the view expressed by Morris (1951) when comparing the mortality from heart diseases at age 5–15 years in 1946–49 as against 1936–39. He found that though the social gradient remained, the difference between the best towns and the worst is now less than half of what it was, and that the decline has taken place in a period during which housing conditions have not improved. "The upshot", he says, "may well be that we are reaching levels of mortality (which he uses as an indirect index of incidence) in the community at which individual constitutional influences are becoming increasingly important."

A measure of the effectiveness of social class differences in areas differing in climate and industry is obviously called for, and it is intended that a survey of this kind shall be carried out next year. It is being directed by Professor Grundy who has invited Medical Officers from fourteen areas in England and Wales to participate. The infants to be studied and followed up for one year are those born in 1952 and the total number is estimated at 22,000. The investigation will be conducted on lines similar to that of the Luton survey, but suitably modified in the light of the experience gained from the pilot survey. Concurrent with the morbidity survey there will also be an enquiry into infant mortality. The collation of all the statistical data will be carried out at the Welsh National School of Medicine.

A contemporaneous survey of this kind has, of course, certain advantages over a national time-trend survey. It allows, for example, differently circumstanced areas to be compared at a particular moment of time. A national time-trend study, on the other hand, has the disadvantages of possible introduction of fallacies as the result of improved standards of diagnosis, changes in nomenclature and amendments of classification of disease.

Luton is one of the areas taking part and it should be interesting to compare the findings of 1952 with those of 1945, both in respect of infant morbidity and infant mortality.

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Dr. J. W. B. Douglas, *Director, Child Health Survey, University of London*: For the last five years a Joint Committee of the Institute of Child Health (University of London) and the Population Investigation Committee have been following the health, growth and development of 6,000 children drawn from all social classes and from all parts of the country.[1] These children are a sample of all those born during the first week of March 1946. At the present time we are in touch with 95% of the surviving children still living in this country and for each child we have a dossier extending from before birth. This dossier shows *inter alia* the salient features of pregnancy and confinement, the changing environment in which the child has been reared, his accidents, illnesses, development and growth. This information was obtained by health visitors who visited the families in 1946, 1948 and 1950.

This enquiry is larger than either of the studies described by the preceding speakers and its aims are rather different. First, we hope to observe in what ways the health and growth of young children are affected by the environment in which they live and by the knowledge and ability of their mothers. This survey provides a unique opportunity to show for the whole country how far poverty and failure to apply existing medical knowledge lead to avoidable ill-health and poor growth. In particular we are anxious to define the group of children, which we believe exists, who, from lack of opportunity or from the ignorance of their parents, are being deprived of the services that should be available to them.

[1]The Joint Committee was set up in 1945 and has throughout been under the chairmanship of Professor James Young. The original sponsors were the Royal College of Obstetricians and Gynæcologists and the Population Investigation Committee. The present sponsors are the Institute of Child Health, the Society of Medical Officers of Health and the Population Investigation Committee. Funds have been generously provided by the Nuffield Foundation. The work of the Committee was made possible by the co-operation of medical officers of health and health visitors throughout the country, and I should like to take this opportunity to thank them again for their help.

The opinions expressed in this note are my own and are not necessarily held by all members of my Committee.

Our second aim is to describe how the home conditions and health of our survey children have changed as families have grown, as new houses have been found, after death or separation of their parents and when there has been a movement upwards or downwards in the social scale. A particular interest attaches to these descriptions because they are based on a sample which adequately represents all young families in the country and which has been followed through a period of great social change.

Our first two aims are primarily descriptive. Our third aim, which will be realized only if the survey continues, is to test the validity of various widely held opinions which seem to us to be based on indirect or insufficient evidence. Many of these opinions relate to behaviour and we should be able to give a direct answer for example to questions about the association of artificial feeding or of maternal deprivation with later disturbances of emotional adjustment. In the same category is the opinion that prematurely born children, apart from their initial high mortality, are likely to be mentally or physically retarded in later life. We have followed up more than 700 legitimate single premature babies each of whom is matched with a baby born at term, coming from the same type of home environment and alike in sex, and in place in the family. We should soon be in a position to show how far, if at all, the premature child is handicapped, and what extra calls on the health services he makes.

There are many problems in social medicine which, owing to their complexity, need a mass, that is to say a largely non-clinical, approach. We hope that this survey will define the scope and limitations of the questionnaire technique which is particularly applicable to these types of studies. In a continuous enquiry such as ours, information can be checked and rechecked and the limitations of memory established. We have, for example, been able to compare the actual history of breast feeding during the first two months with the remembered history given two years later, and we have equally close checks on the accuracy with which mothers remember the dates of admission of their children to hospital and the birth-weights of their babies. In general we are impressed with the accuracy with which important events in the life of a child are remembered and dated by his mother, and we believe that the large-scale questionnaire survey has a valuable part to play in socio-medical research. It is therefore gratifying to hear Dr. Miller say that many of the conclusions reached in his much more intensive and clinical investigation are closely similar to those already published by us.

We have been impressed with the difficulties of social classification and we suspect that an exclusive concern with the economic aspects of class may be deeply misleading. For example, the Registrar-General's classification into five classes seems to us unsatisfactory because it includes in classes II and III relatively large groups of infants who have mortality rates which compare favourably with those in class I. The modification of the Registrar-General's classification which we have used goes a little way to meet these criticisms but is certainly very imperfect. We hope by studying the many facets of environment, education and social status to arrive at a classification that has a more meaningful relation to growth and health. And we hope during this social analysis to find out where the present health services are failing and how we can make fuller use of existing medical skill and knowledge.

If, as we hope, we are able to follow these children through their school years, a wide field of medical and social research will be opened up. In March 1952 a special school medical examination will be given and thereafter the children will be seen by the school nurse once a term and examined by the school doctor once a year. Specialist examinations will be arranged when necessary. Many hundreds of medical officers will be examining these children and one of our main difficulties is to ensure that the same pattern of examination is given to each child. Our general aim will be to observe the achievement of these children against the background of their ability, health and opportunities.

Later comment (19.2.52):—In our national enquiry a social gradient in disease was found even within the most prosperous 8 per cent of the population. This is a finding which Dr. Dykes has done nothing to explain.

Since hearing his doubts about the validity of my criticism that the pooling of social classes in the Luton enquiry has blurred class differences, I have regrouped our own material according to his classification. The following are the mean monthly rates of lower respiratory infections per 1,000 children exposed to risk during the first two years of their lives.

Classes I–III, 12·9
Classes IV and V, 13·9 (or if all agricultural workers are excluded, 15·5)

These rates are not significantly different. Thus if we had been content with this crude analysis we should have accepted the Luton conclusions, and missed the very marked social class differences which a more detailed examination shows.

Section of Otology

President—G. E. ARCHER, M.B., Ch.B., F.R.C.S.E., D.L.O.

[*November* 2, 1951]

Suppurative Labyrinthitis

PRESIDENT'S ADDRESS

By G. E. ARCHER, M.B., Ch.B., F.R.C.S.E., D.L.O.

I HAVE chosen to talk about suppuration of the labyrinth, because very early in my career I saw some of the disasters following the performance of the radical mastoid operation at a time when routine tests of the labyrinthine function were not always performed. It seemed to me that to operate blindly on this area without some knowledge of the condition of the labyrinth was courting trouble.

It has been suggested that our views of the diagnosis and treatment of labyrinthitis are now fairly well established. This may be so, but I think we might profitably examine them again.

Although the introduction of chemotherapy and the antibiotics has removed some of the terrors labyrinthitis had for us in the early years of our experience as otologists, the line of treatment to be followed and the decision when to operate in a particular case is often difficult and calls for much deliberation and judgment.

The labyrinth may be infected by various routes, but I propose to deal only with labyrinthitis secondary to suppurative otitis media.

The descriptive terms I have employed are:

(1) Acute Purulent Labyrinthitis, for purulent invasion of the endolymph spaces producing labyrinthine symptoms in cases of acute middle ear suppuration.

(2) Manifest Purulent Labyrinthitis, for cases of secondary invasion of the labyrinth producing labyrinthine symptoms from chronic middle-ear suppuration.

(3) Latent Labyrinthitis, where a non-functioning labyrinth is discovered without labyrinthine symptoms whilst active chronic middle-ear suppuration persists.

(4) Serous Labyrinthitis with labyrinthine symptoms often intermittent where labyrinthine function is not lost completely. It may be impaired or may recover completely.

(5) Circumscribed Labyrinthitis, where labyrinthine function persists with or without symptoms of labyrinthitis, but erosion or necrosis of the bony labyrinthine capsule has taken place. Erosion into the facial canal has been included in this Group.

This conforms to the usual classification except that I have grouped the cases of purulent labyrinthitis occurring in acute suppurative otitis media separately from those occurring in chronic suppurative otitis media, as they are different in type and require separate consideration.

There may be some divergence of views as to the pathological division of labyrinthitis into serous and purulent. Clinically it may be extremely difficult to say whether any particular case is one or the other. It has been suggested that if some function of the labyrinth remains active, suppuration within the labyrinth has not taken place, and if recovery of function occurs only a serous labyrinthitis can have existed. It seems to me that this premise is by no means certain. Since the introduction of chemotherapy with the sulpha drugs and the use of the antibiotics a suppurative process within a closed space may, and often does, resolve; so that the appearance becomes that of a serous inflammation, later, with recovery of function. Therefore, suppuration may occur in the peri- and endolymphatic spaces, may resolve and be followed by recovery of function.

My observations are based on the mastoid surgery which I have practised from 1921 to 1951, during which period I have performed about 1,400 mastoid operations. The term "mastoid operations" includes all those operations which have been performed for suppurative disease of the middle ear, excluding myringotomy and simple removal of polyps or granulation tissue through the meatus, and also excluding, of course, operations through the mastoid for non-suppurative conditions such as fenestration operations, operations for facial paralysis or for destruction of the labyrinth for vertigo in non-suppurative disease.

I have divided this work into three periods: (1) 1921–1936: pre-sulpha drug period. (2) 1937–1945: the chemotherapy period, and (3) 1946–1951: the period in which the antibiotics have been in general use.

All cases have been operated on by me personally, and are collected from private practice and major hospitals. Operations performed at small isolated hospitals are not included in this survey because records are often sketchy and incomplete, but I do not think their omission alters the over-all picture. This is a fairly typical cross-section of mastoid surgery and is the background against which I wish to consider labyrinthitis to-day.

TABLE I.—MASTOID OPERATIONS 1921–51

Age groups	Acute male	Acute female	Chronic male	Chronic female	Totals
1–10	172	167	50	44	433
11–20	44	77	86	96	303
21–30	17	41	79	87	224
31–40	24	12	84	68	188
41–50	16	11	71	46	144
51–60	3	4	31	27	65
61+	2	2	9	9	22
	278	314	410	377	1,379

In the acute cases, the high figures for the younger age groups are due to the frequency of the performance of the simple cortical operation in children and young adults. In the chronic cases the figures are much more constant, generally being higher for adolescence and middle age.

TABLE II.—ALL MASTOID OPERATIONS

	Acute male		Acute female		Chronic male		Chronic female		Totals	
Years	No.	Average per year	No.	Average per year	No.	Average per year	No.	Average per year	No.	Average per year
1921–36	186	12	201	13	201	13	179	11	767	48
1937–45 chemotherapy	68	8	90	10	118	13	133	15	409	45
1946–51 antibiotics ..	24	4	23	4	91	15	65	11	203	34
	278		314		410		377		1,379	44

The decline in the number of operations in acute cases is distinctly shown.

The number of operations in chronic cases remains remarkably constant in spite of treatment with sulpha drugs and antibiotics.

TABLE III.—MASTOID OPERATIONS

	Non-complicated				Complicated			
	Acute		Chronic		Acute		Chronic	
Years	No.	Average per year	No.	Average per year	No.	Average per year	No.	Average per year
1921–36	355	22	279	17	32	2	101	6
1937–45	145	16	180	20	13	1	71	8
1946–51	47	8	100	16	—	—	56	9
	547		559		45		228	

"Non-complicated" refers to (*a*) the acute cases—simple cortical mastoid healing without complications; (*b*) the chronic cases—those where radical or modified radical mastoid operation has been performed and healed without complications. "Complicated" includes all types of complications including circumscribed labyrinthitis found at operation. The decline in the number of acute cases and the number of complications is striking, whilst the figures remain more nearly constant for the chronic cases. The causes of this decline in the acute mastoid operation and complications of acute otitis media are several. Whilst no doubt modern treatment by chemotherapy and antibiotics has played, and will continue to play, a large part in eliminating these fell diseases, other important factors have also been at work.

The general public seek medical attention earlier than formerly and realize more the seriousness of the running ear. But perhaps an even bigger factor has been the training of medical students. Whereas attendance in the Ear, Nose and Throat Department was voluntary, now it is almost universally compulsory in the course of undergraduate teaching, so that the new generation of doctors is fully conscious of the seriousness of complications of ear disease, and the importance of its early recognition. These cases are now referred to hospital at a much earlier stage. Those of us in practice soon after the First World War will have vivid memories of the severe cases of lateral sinus thrombosis with septicæmia and pyæmia, and huge extradural abscesses, which were a common occurrence. These have been gradually declining in frequency, and since the advent of the sulpha drugs and penicillin, have become almost a rarity. In spite of this progress, chronic suppurative otitis media is still extremely common, the cases fill our out-patients' departments, and the possibility of complications from this source is still a real one.

TABLE IV.—273 COMPLICATIONS FOUND IN 1,379 MASTOID OPERATIONS

Years	Labyrinthitis all types	Meningitis	Malignant disease	Sinus thrombosis	Brain abscess	Pyæmia	Septicæmia	Totals
1921–36	59 **3·7**	21 **1·3**	4 **0·25**	27 **1·7**	20 **1·25**	—	2 **0·125**	133 **8·3**
1937–45	52 **5·8**	8 **0·9**	7 **0·8**	10 **1·1**	5 **0·55**	2 **0·22**	—	84 **9·3**
1946–51	46 **7·7**	1 **0·17**	1 **0·17**	2 **0·33**	6 **1·00**	—	—	56 **9·3**
	157	30*	12	39*	31	2	2	273

*Some of these cases have suffered labyrinthitis, but the final state—either before recovery or death—is the one recorded.

Heavy figures are average number of complications per year.

This analysis of complications shows meningitis and lateral sinus thrombosis declining in frequency, whereas the incidence of labyrinthitis does not show the same trend.

It was considered necessary to operate on the labyrinth in 52 cases.

TABLE V.—ANALYSIS 52 LABYRINTH OPERATIONS

	1921/36	1937/45	1946/51	Total
Acute purulent labyrinthitis with meningitis	3 **2**	3 **3**	—	6 **5**
Manifest purulent labyrinthitis	2	6	3	11
" " " with cerebellar abscess..	1	—	—	1
" " " with meningitis ..	5 **5**	1 **1**	—	6 **6**
" " " with sequestration ..	—	1	2 **1**	3 **1**
Latent labyrinthitis with facial paralysis	—	2	—	2
" " with cholesteatoma and sequestration	1	1	—	2
Serous labyrinthitis	3	9	4	16
" " with sequestration	—	1	—	1
	15 **7**	24 **4**	9 **1**	48 **12**

Heavy figures are the number of deaths.

In addition 4 cases (2 with facial paralysis) were operated upon as cases of chronic suppurative otitis media with latent labyrinthitis. At operation these were found to be malignant growth later confirmed by microscopy.

The 12 cases, 6 acute and 6 chronic with meningitis with labyrinthine symptoms were those treated by translabyrinthine drainage—pus found in the labyrinth and internal auditory meatus—only one survived. In my experience cases of meningitis treated by other methods appeared to do better. Only those showing definite labyrinthine signs or symptoms would be submitted to labyrinthine drainage, and now only if not responding to conservative treatment with chemotherapy and antibiotics.

TABLE VI.—LABYRINTH OPERATIONS

	1921–36	1937–45	1946–51		Total
	16	27	9	=	52
Average per year	1	3	1·5		
Deaths from meningitis ..	7	4	—	=	11

These figures are small, and statistically of no value. But one wonders was it that in the earliest period the severe infections killed our patients by some intracranial complications, usually meningitis? Meningitis accounted for 11 deaths amongst my patients with labyrinthitis.

In the second period meningitis may have been averted by sulpha drugs, but labyrinthine symptoms were not uncommon, whilst in the third period, the disease was controlled, and often cured, by the antibiotics.

Acute Suppurative Otitis Media, Labyrinthitis and Meningitis

Even relatively mild cases of acute otitis media occasionally show slight labyrinthine symptoms. In acute mastoiditis, in my experience, labyrinthine symptoms have not been shown. In meningitis occurring with an acute suppurative otitis media, labyrinthine symptoms have been present occasionally (6 out of 30) but this seems to be exceptional. In one case of meningitis following an acute suppuration of both middle ears and mastoiditis in which the patient recovered, total deafness followed in both ears, but at no time was there any vestibular disturbance, certainly no labyrinthine vertigo was present. There have been 6 cases (of which 1 recovered) of suppurative meningitis following an acute middle-ear suppuration in which translabyrinthine drainage had been performed, and pus had been found in the labyrinth and drained from the internal auditory meatus, but in these cases the labyrinthine symptoms had been obscured by the acute meningitis and it is impossible to say whether the route of infection of the meninges was via the labyrinth, or whether the acute purulent labyrinthitis and meningitis were concomitant.

Chronic Suppurative Otitis Media and Labyrinthitis

Chronic suppurative otitis media presents quite a different problem. Here direct spread of chronic disease takes place, eroding the bone into the labyrinth through the windows, promontory or canals. In these cases intermittent symptoms of labyrinthine irritation with recovery often occur before the disease spreads into the labyrinth and destroys it. On the other hand it is surprising how often complete destruction takes place without manifest labyrinthine symptoms.

I can record a few of these, notably Major W., who only sought advice on account of left facial paralysis which had developed after he had been thrown from a horse and suffered slight concussion. The only history of any ear disease was some vague story of having had earache at school. The drum membrane showed a dry perforation of Shrapnell's membrane. X-ray examination revealed no fracture of the base of the skull, but the presence of a large cavity in the petrous bone. He had total deafness and a non-reacting labyrinth on the side of the lesion. At operation an enormous cholesteatoma, the size of a large walnut, was discovered, which had destroyed much of the petrous bone. There was a small black area over the dura mater which was not explored; although there were slight signs of tract involvement, they were indefinite, and it was decided that the temporo-sphenoidal lobe should not be explored. Although he admitted his knowledge of deafness in the left ear, at no time had he ever suffered vertigo. This case was recorded amongst others of large cholesteatomas collected by Jefferson and Smalley.

Mrs. P. attended hospital with a history of facial paralysis for some twenty years. She now complained of a discharging ear and some deep-seated pain. X-ray examination showed cavitation of the petrous bone, and at operation a cholesteatoma was found which had excavated the petrous bone almost to the apex, leaving a thin shell of bone like a glove finger. There was no history of vertigo at any time. Both these patients made uninterrupted recoveries, but, of course, the facial paralysis persisted.

Two other cases of latent diffuse labyrinthitis had sought advice on account of the onset of facial paralysis. In routine examination of these cases non-functioning labyrinths were discovered, and labyrinthotomy performed. In both cases healed labyrinths with bony changes and no fluid in the labyrinth were revealed at operation.

Manifest purulent labyrinthitis occurring in chronic suppurative otitis media:

(i) These may come after repeated labyrinthine attacks, i.e. serous labyrinthitis.

(ii) Without any previous hints of labyrinthine involvement.

Both seem to be equally dangerous and likely to spread to a meningitis. Of 21 cases in my series, 11 recovered after operation on the labyrinth without further complications. 7 died of whom 6 were from meningitis already present when first seen, and 1 from labyrinthitis, with sequestration, brain abscess and lung abscess.

I would say the treatment should be expectant with heavy chemotherapy and antibiotics; but a close watch should be kept for meningitis. If the case is deteriorating, and the first signs of meningitis become evident, a labyrinthotomy should be no longer delayed.

Serous Labyrinthitis

This often presents a problem: what operation should be performed and when? In the intermittent serous labyrinthitis case one can shelter behind the penicillin screen, but sooner or later an operation should be undertaken, otherwise the risk of spread of infection will become greater, and a manifest purulent labyrinthitis may supervene. This risk we are not justified in prolonging indefinitely.

There are two lines of approach:

(1) To do a radical mastoid operation only, and wait and see if this is going to produce a cure. This may be too risky a proceeding even with the penicillin screen.

(2) To do a labyrinthotomy.

If the attacks of labyrinthine disturbance are frequent, severe and slow of recovery, especially if accompanied by deep-seated boring pain, and especially if the pus from the meatus is of a creamy consistency, containing bone cells, then I think one should proceed to do a labyrinthotomy, without doing any preliminary mastoid operation. My experience of doing the radical mastoid operation only on these patients has been that a second operation of labyrinthotomy is almost invariably necessary,

and a period of waiting, which is unsatisfactory to surgeon and patient alike, ensues. If, on the other hand, the attacks are slight, infrequent, with variable discharges, and more innocent in type, then, I think, it is justifiable to do a radical mastoid operation only, with penicillin before and after. At the same time I should be prepared to do a labyrinthotomy, but to proceed only if necrosis around the promontory and windows was found to be present. Many of the milder cases have healed after a radical mastoid operation only.

Almost certainly mistakes have been made.

A few years ago Mr. B. with chronic suppurative otitis media, copious, thick creamy pus coming from the ear, was advised to have a radical mastoid operation and probably a labyrinthotomy in view of the fact that he was suffering deep-seated pain and having frequent severe attacks of labyrinthine vertigo. He had a normal ear on the other side, and therefore these attacks were coming from the affected ear, and the labyrinth was still, therefore, active. I advised labyrinthotomy. For various reasons the operation was delayed. He procrastinated, giving business reasons as an excuse, and I was probably not as insistent on the danger as I might have been. Eventually, at operation, necrotic bone over the inner tympanic wall was discovered with sequestration towards the anterior part of the middle ear. In removing a sequestrum from this region violent hemorrhage occurred, almost certainly from the carotid artery. It was controlled by packing, but one complication after another then followed. An enormous temporosphenoidal abscess was evacuated, its formation expedited by the softening of the brain substance due to interference with the blood supply. He finally developed a lung abscess and died. Although at the time of the operation he still had an active labyrinth, sequestration of the petrous bone was taking place, and in this case obviously operation was far too long delayed.

In another patient where bilateral labyrinthotomy was considered necessary one wonders if by some more conservative treatment some of the function of the right labyrinth might not have been saved. Mr. H. was admitted to hospital with labyrinth disturbance in the right ear. Bilateral chronic middle-ear suppuration was present. On the left side the labyrinth was reacting normally. On the right side he had severe deafness. As the symptoms of vertigo, nausea and vomiting were so severe and not subsiding, it was decided to operate on the right labyrinth. Vestibulotomy, inferior and superior, was performed and perfect recovery from the operation took place. Some fifteen months afterwards he was readmitted to hospital with symptoms of acute labyrinthitis of the left side. He now had total deafness of the left ear with no caloric response. Raised temperature and deep-seated pain suggested the onset of meningitis although the lumbar puncture gave normal cerebrospinal fluid. Labyrinthotomy of the left ear was performed. He recovered, but complete healing has not taken place. A very scanty discharge of pus recurs at intervals from the left ear, and I have kept him under observation, seeing him at monthly intervals now for some four or five years. This poor man is alive, but totally deaf. His balance in the dark is, of course, very poor, but he can walk about in daylight.

One wonders, if with more conservative approach to the right ear, doing the radical mastoid operation only and giving sulpha drugs and penicillin had it been available, recovery of the labyrinthine function might not have taken place.

The difficulty in these cases seems to be to decide when a serous case is about to become a purulent one. Recurrent labyrinthine storms are happening. One of these will be the last, either because definite bacterial invasion will have taken place, or because the intralabyrinthine tension will have destroyed the cochlear and vestibular organs.

The following points may serve as a guide:

(*a*) *Pain*: an unreliable guide, but if severe and continuous I regard it as significant.

(*b*) *Temperature* is said not to be raised, but even very slight irregularities may be important indications of activity of infection.

(*c*) *Pus*: creamy and containing bone cells—means bone erosion is going on.

If these symptoms and signs are present a purulent labyrinthitis is imminent.

I was taught never to hesitate to operate on a dead labyrinth, but always to hesitate to operate on a live labyrinth. If the above signs and symptoms are present and severe labyrinthine storms are recurring and the condition is not yielding to treatment with sulpha drugs and antibiotics, I would not hesitate longer, but would perform a labyrinthotomy rather than risk the onset of meningitis.

If vertiginous symptoms and signs such as nystagmus are still present, constant or intermittent, assuming that the other ear is normal, then the labyrinth is not entirely dead. If we approve the generally accepted indications for a radical mastoid operation these are still more applicable here, and operation is indicated. To do a radical mastoid operation and wait and see may be dangerous, but probably not so dangerous now that a suitable antibiotic screen can be put up. I suggest this procedure in milder cases. I have followed this course many times, and obtained a dry ear, perfectly healed, with cessation of symptoms; but if a dry ear and cessation of symptoms are not obtained, then drainage and destruction of the labyrinth are required. How long should we wait in such cases? It seems doubtful if any rule can be laid down. I would suggest something in the region of three months. If, on the other hand, the symptoms of vertigo are severe, deep-seated pain is experienced, and bone pus is draining freely, then one should proceed at once to do the labyrinthotomy operation. I cannot recall any case in which the radical treatment, that is, the labyrinthotomy done in a one-stage operation has been regretted, except in the single case of Mr. H., already described, where acute labyrinthitis developed later on the opposite side.

Latent Labyrinthitis

With the advent of sulpha drugs and antibiotics our attitude in cases of latent labyrinthitis may be modified. In a case of chronic suppurative otitis media where it was considered necessary to operate and where routine examination of labyrinthine function gave no reaction, it was recommended that labyrinthotomy should be performed. If this were not done there was the risk of precipitating meningitis. This risk would now appear much less. If active suppuration is still present within the labyrinth, pus must almost certainly be escaping somewhere and its point of exit should be discovered within the tympanic cleft at the time of operation. In such a case the obvious course would be to follow any fistulous tract and drain the labyrinth. If the labyrinth is non-functioning and has been so for a long time, it is possible that the disease is no longer active within the labyrinth, that possible paths for spread of infection are now sealed off and it may be safer to leave the labyrinth untouched than to risk opening up channels already safely closed. Therefore, my practice now would be, if recent destruction of the labyrinth has taken place, to wait and not operate. At a later date if middle-ear suppuration continues, to operate with penicillin screen and perform the radical mastoid operation and be prepared to follow any fistulous tract into the labyrinth if pus exudes from such an opening. If the labyrinth has been dead for a long time, with the same precautions I would do only a radical mastoid operation and await events unless some pathological lesion is revealed pointing to active suppuration continuing in the labyrinth.

If operation on the labyrinth is indicated, the classical operations are not always necessary. Much depends upon the findings at operation. Necrotic bone must be removed and the vestibule opened. If drainage of the vestibule is complete more elaborate operation is not always necessary. The procedure of inferior and superior vestibulotomy as described by West and Scott has been my usual practice.

Circumscribed Labyrinthitis

Out of a total of 787 operations for chronic suppurative disease, and among 228 cases showing various complications, circumscribed labyrinthitis was found in 157 cases. Of these 105 healed after radical (or modified) mastoid operation without further complications.

The sites of these lesions are shown in Table VIIA, which also shows the sites in some of the 52 cases of labyrinth operation (Table V).

Table VIIa.—Circumscribed Labyrinthitis—Site of Lesion

	Semicircular canals	Windows	Promontory	Facial canal	Not recorded
Total 157	41	16	6	69	25
	Healed after mastoid operation without further complications				
Total 105	34	7	2	57	5
	Labyrinth operation performed in 52 cases (4 malignant disease)				
Total 52	7	9	4	12	20

Table VIIb.—Cases of Labyrinthitis Showing Site of Invasion of Labyrinth or Erosion into Labyrinthine Capsule Found at Operation on Labyrinth

	Semi-circular canals	Windows	Promontory	Facial canal	Others not identified
Purulent labyrinthitis 27 cases	—	6	1	5	12 cases of meningitis 1 sequestration
Latent labyrinthitis 4 cases	—	—	1	—	2 Massive cholesteatoma 1 sequestration
Serous labyrinthitis 17 cases	7	3	2	7	
Totals 48 cases	7	9	4	12	16

The discrepancy of totals is due to there being more than one lesion in some cases.

Cholesteatoma usually erodes into the canals and is relatively benign. The cases of cholesteatoma and canal erosion have usually healed after radical (or modified) mastoid operation.

Chronic suppuration causes, more commonly, necrosis of the inner tympanic wall and in these a labyrinthitis is more likely to occur.

When cholesteatoma erodes into the canals the invasion is slow and the lumen of the canal may be shut off by adhesions, and general spread of infection then does not take place.

Suppuration opens the windows widely. Bacterial invasion of the vestibule occurs producing a manifest purulent labyrinthitis and meningitis may follow rapidly.

CONCLUSIONS

In acute middle-ear suppuration the incidence of meningitis and other intracranial complications has been reduced since the introduction of chemotherapy and antibiotics.

In chronic suppurative otitis media, meningitis is less frequent, but cases of labyrinthine disturbance have not diminished in numbers.

(1) *In acute suppurative otitis media.*—In meningitis occurring with acute suppurative otitis media, translabyrinthine drainage would appear to be of doubtful value, and the loss of cerebrospinal fluid might be more harmful than beneficial. Heavy dosage with sulpha drugs and antibiotics with repeated lumbar puncture and intrathecal penicillin, and in some cases wide exposure of the dura mater through a simple mastoid operation, seems to hold out as good a prospect of cure as other methods.

(2) *In chronic otitis media.*—(*a*) In meningitis occurring with a chronic suppurative otitis media, if not yielding to treatment by conservative measures, chemotherapy, antibiotics and intrathecal penicillin, a mastoid operation with translabyrinthine drainage if labyrinthine symptoms have been present, to open up all the microscopically diseased tissue, draining these spaces to eliminate, as Mr. T. B. Layton would say, the factory of organisms, is a justifiable and right procedure.

(*b*) With necrotic labyrinth capsule and loss of labyrinth function indicating a purulent labyrinthitis it is imperative to operate on the labyrinth.

(*c*) With recurrent labyrinthine symptoms, that is, serous labyrinthitis, labyrinthotomy is advocated under certain conditions, namely, if the labyrinthine disturbance is severe, prolonged and frequently recurring, and accompanied by deep-seated pain, even if the labyrinth function recovers between the attacks. If not controlled by sulpha drugs and antibiotics, it is safer to do a labyrinth operation between attacks, than to wait until a manifest purulent labyrinthitis develops.

[*December* 7, 1951]

Some Remarks on Vestibular Examination

By Professor L. B. W. JONGKEES, M.D.(Amsterdam)

I AGREE with Arslan (1950) that we should insist upon the following conditions for clinical examination of the vestibular system: (1) The qualitative and quantitative physical properties of the stimulus must be known exactly. (2) The effect of the stimulus on a normal organ should be quantitatively and qualitatively known and also the effect of any changes in the stimulus. (3) The results should be given in the form of precise figures or expressed as a graph.

Exact knowledge of all the factors involved in these conditions would imply a perfect understanding of the whole physiological process, which we do not possess—nevertheless insistence upon the conditions is justified, if only as a means of progress.

One point calls for particular emphasis: Though some neurologists and otologists have warned us against the use of overstrong stimuli, others continue to use them. I am glad here to be able to refer to the earlier investigations of Fitzgerald and Hallpike who, together with Cawthorne, started to put the caloric examination of the labyrinth upon a scientific basis.

Although the caloric examination of the vestibular organ is admittedly not a physiological procedure it may nevertheless give us valuable information about its function and especially, if proper precautions are taken, about the function of the lateral semicircular canal. It is possible to apply stimuli of reasonable constancy and we are able to predict the normal responses within reasonable limits. And finally we can plot the results on a simple graph.

Some precautions are necessary:

Too strong stimuli should be avoided. They do not lead to better results and only worry the patient. The strength of the stimulus is essentially determined by the temperature of the water, differences of more than 7° from body temperature should not be used, because at this point the vestibular reactions are nearly maximal and the well-being of the patient is not disturbed.

Within limits, the quantity of water used to perform the caloric test is not of much importance in determining the size of the stimulus. With very small quantities, however, inaccuracies occur.

The position of the subject during the caloric test is not so very important as long as a stream of endolymph occurs, following caloric stimulation and provided the patient's head is not moved during the test. If we repeat the examination frequently the results will be sufficiently identical in the immobile subject. However, if the position of the labyrinths is changed the responses are different for every test. Even if the patient is examined in a fixed position it is possible to have a nystagmus reappear after the end of the normal reaction if the head of the patient is rotated on one axis or another.

Stimulation of the labyrinth influences the whole body: sensations, nystagmus, past-pointing, deviations in walking are the best-known phenomena. Though I appreciate the value of sensations for the rotatory test, they are valueless in caloric examinations because many normal people do not have any sensations of rotation in this test. In the past-pointing and the walking test many extra-vestibular factors (difficult to eliminate) influence the results which themselves are not easily

measured. The nystagmus seems to be the only important symptom to judge the effect of caloric stimulation—but nystagmus shows various properties: time of latency, frequency, strength, duration. Some authors attach great importance to the time of latency but others reject it as unimportant. I agree with the latter, not only because this phenomenon depends largely on the structure of the temporal bone but particularly on account of the nature of the latent time. Nystagmus is a complex phenomenon—it consists of a slow, vestibular phase and a quick phase which is probably not of vestibular origin. When the time of latency is measured we wait for the appearance of the first quick jerk. The slow phase, however, precedes the quick one for a longer or shorter time, as is often demonstrated in men and animals.

The recognition of the beginning of the first slow deviation of the eye is really required for the measurement of the true vestibular time of latency. This, however, is a practical impossibility. To measure the time of latency to the first quick jerk, however, seems to me to be meaningless as this time is not dependent on vestibular action.

The frequency of the nystagmus is a quality which lends itself admirably to observations and measurements but the results are not identical if the test is repeated under similar conditions. It is even possible to decrease the frequency of the nystagmus by many extra-vestibular stimuli, as for instance, pressure on the tragus, the smell of ammonia, or indirectly it may be affected by an emotional state. Therefore it cannot be considered a good indicator of vestibular function.

Instead we find that its duration is the only quality of caloric nystagmus which can be accepted as a reliable index of its magnitude. If the test is repeated under identical circumstances the answer is identical, provided that the stimulus is not too big and that the interval between two tests is long enough. A pause of six minutes between two tests seems to be sufficient.

In this case we too, of course, measure the duration of the quick phase of the nystagmus. Here, however, the difference between duration of quick and slow phase is so small that it may be neglected. Even the duration of caloric nystagmus is not of pure vestibular origin; fixation of the eyes may influence the nystagmus greatly, therefore its elimination with Frenzel's glasses may clarify the results.

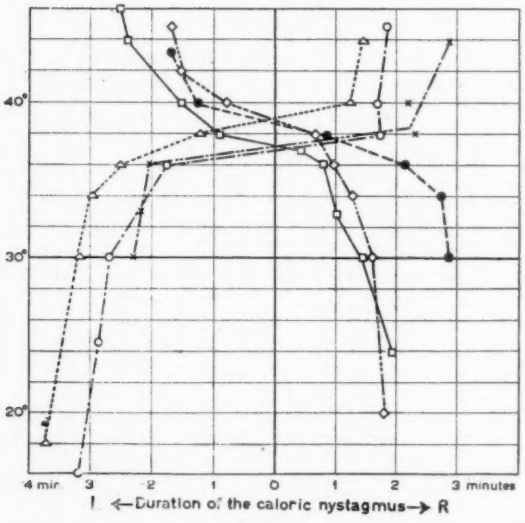

FIG. 1.—The influence of the temperature of the water used for the caloric test. In 6 subjects the duration of the nystagmus is shown as a function of the temperature of the water used for the test.

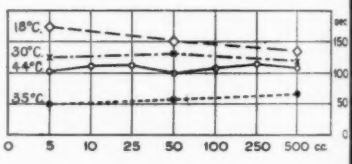

FIG. 2.—The influence of the quantity and temperature of water used for the caloric test. The duration of the nystagmus in seconds is shown as a function of the quantity of the water used.

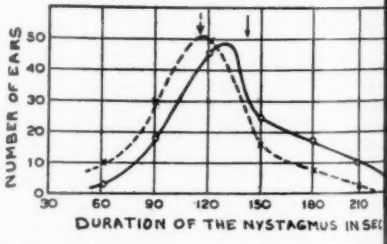

FIG. 3.—Frequency distribution of nystagmus durations for caloric tests found to occur in normal subjects.

———Responses to cold (30° C.).
. . . . . Responses to heat (44° C.).

(Figs. 1, 2 and 3 are reproduced by permission of the Editor, *Archives of Otolaryngology*. Figs. 1 and 2 (1949), **49**, and Fig. 3 (1948), **48**.)

In a series of tests in normal subjects with and without Frenzel's glasses I was able to establish that the various extra-vestibular stimuli which strongly affect the frequency of the nystagmus, have no influence at all on the duration of the nystagmus behind Frenzel's spectacles but do influence the duration of the nystagmus when the fixation of the gaze is not made impossible. I think this point is strongly in favour of Frenzel's glasses.

The best results from the caloric test are obtained by its performance with both cold and hot water. Only if both stimuli provoke the appropriate nystagmus, i.e. heterolateral nystagmus for cold and homolateral for hot stimulation, may we conclude that the labyrinth is alive. Otherwise vascular or sensitive reflexes may simulate a vestibular nystagmus.

Furthermore, only the double bilateral caloric test, i.e. with cold and warm water in both ears, can differentiate between a predominance of the function of one labyrinth and a directional preponderance of the nystagmus. When results in a great many normal persons are compiled it would appear that the individual reactions vary extremely.

It is necessary therefore in drawing conclusions as to hyper- or hypo-reactivity of one or other labyrinth from the duration of the nystagmus alone to take account of these normal variations. A predominance of the function of one labyrinth is extremely rare in normal people (5%) but a directional preponderance of the nystagmus is found in about 17% of people who never complained about vertigo and who show no other vestibular or auditory disturbances. This same phenomenon was found by various methods (Kobrak, simultaneous irrigation of both ears, measurement of the frequency of the nystagmus) and was only accepted if the difference of the reactions in one direction and the other exceeded 20%. I think that this experience is of great importance because to most investigators a directional preponderance is an accepted proof of the existence of objective deviations (e.g. in Ménière's disease De Kleijn and Versteegh (1927), Hallpike (1943) and Van Deinse (1946) found 17–23% directional preponderance cases; this means that the percentage is identical with the percentage I found in normal subjects).

The well-performed caloric test may supply us with valuable data, if the results are accepted very critically. The interpretation of the results, however, is very delicate. The normal spread is very large, directional preponderance is often met with in normals and does not in itself prove otoneurological abnormality.

Nevertheless the caloric test is indispensable because it may give us some very valuable data.

The caloric reactions show whether a vestibular organ reacts, whether the two labyrinths react identically, whether the reaction of a vestibular organ changes during a disease, and, if it is carefully interpreted, whether a directional preponderance is present.

However, the caloric test is not the final answer to vestibular examination, but there is another step which may lead us further. This is the examination of the vestibular organ by means of its specific stimulus, i.e. acceleration. But the rotatory examination, as it has been performed for many years according to Bárány, is not only a test of very restricted value but also dangerous to the function, of even a normal labyrinth.

The old rotatory test does not fulfil some of the conditions which we demand for a satisfactory vestibular test. The stimulus is not exactly known, the stimuli at the beginning of rotation and the deceleration at the end counteract each other. The reactions of normal people, apart from sickness and vomiting, are very inconstant. The stimulus is far above the physiological limit and it is no wonder that many otologists and neurologists avoid this test. In doing so however they go rather too far.

The best way to examine an organ of sense is to use its specific stimulus (Egmond *et al.*, 1949). First of all it is necessary to give one pure stimulus and not two overlapping, counteracting stimuli. This method was introduced by Veits who started the examination in the rotation chair with a subliminal acceleration. When a certain high constant rotational velocity is reached the chair is stopped and one pure stimulus, the deceleration, acts upon the vestibular system. If we now drop the extremely big stimulus of Bárány and replace it by small stimuli, an examination within physiological limits results. I quite agree that this way of stimulation is not purely physiological. After-sensations and after-nystagmus, the phenomena by which we judge the vestibular function in this case, prove this point. In normal life an acceleration is always followed immediately by a deceleration and for these movements the vestibular organ is perfectly adequate. On the other hand audiometry may give very good results notwithstanding the fact that pure tones are hardly normal in daily life.

If accelerations are given, which cause deviations of the cupula of a magnitude that may be provoked by movements in daily life we may hope to get information about the normal functions of the semicircular canals. And if a series of stimuli of different intensities is given we may get an insight into the function of a part of the labyrinth through its total domain of physiological activity. There is one further advantage. If one pure stimulus is given the sensation of turning is very distinct and may be measured as exactly as the sensation of hearing in the audiogram. In that way we get two measurable responses to vestibular stimulation, nystagmus and sensation. And, if we plot the duration of these two phenomena after various stimuli of different intensity on a logarithmic scale, a very easily read graph is the result: the cupulogram (Fig. 4).

I need not describe the technique of this method of which full details are given elsewhere (Egmond *et al.*, 1948) though precautions to keep away extra-vestibular stimuli from the patient are necessary. A good technique, only possible after thorough practice, is essential but the apparatus necessary for the performance of cupulometry may be simple and cheap (Fig. 5). This test may yield results, which cannot be obtained by other methods of examination of the labyrinth.

In the old-fashioned rotating test it is possible to find a different duration of the after-nystagmus after rotating clockwise and anticlockwise. With the aid of Ewald's law on the greater activity of the

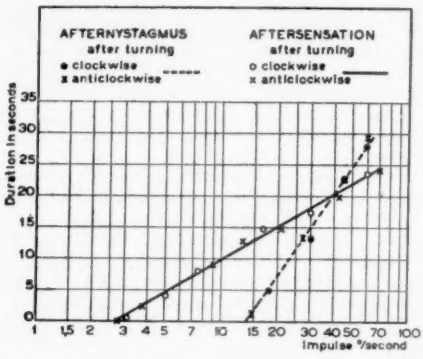

FIG. 4.—Normal sensation- and nystagmus-cupulogram. On the X-axis the impulse is registered in degrees per second, on the Y-axis the duration of the after-reaction in seconds.

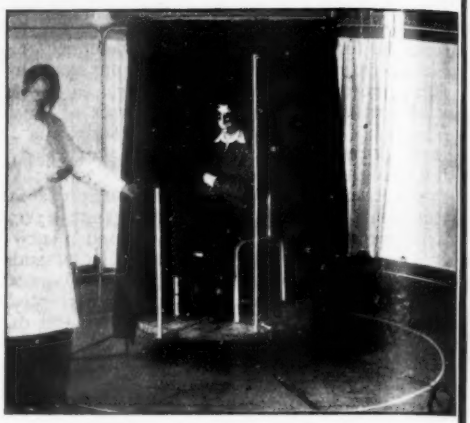

FIG. 5.—Simple rotating room necessary for cupulometry.

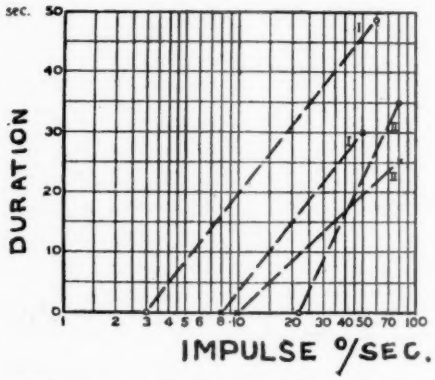

FIG. 6.—A schematic diagram of the two possible types of directional preponderance. *Left* (I, I): Parallel course of the nystagmus cupulogram after clockwise and anticlockwise rotation. *Right* (II, II): Intersecting type.

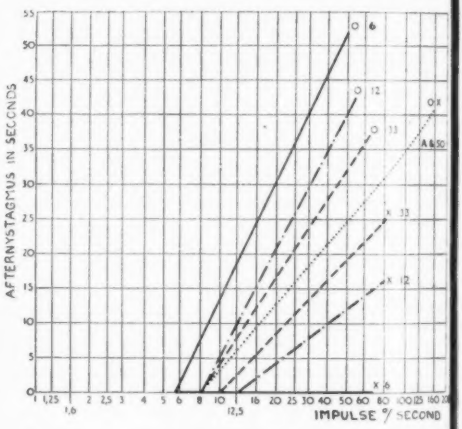

FIG. 7.—Nystagmus cupulogram before and after the fenestration operation. A & 50: Nystagmus cupulogram for both clockwise and anticlockwise rotation before and 50 days after the fenestration operation. X indicates anticlockwise and O clockwise rotation. The figures indicate the number of days after the operation when the cupulogram was made.

(Figs. 4 and 7 are reproduced by permission of the Editor of the *Journal of Laryngology and Otology*. Fig. 4 (1948), **62**, and Fig. 7 (1949), **63**.)

ampullopetal endolymph stream in the horizontal canals, conclusions are drawn as to which side is affected.

The observations of Cawthorne, Fitzgerald and Hallpike (1942) upon the caloric responses have already cast doubt upon the validity of Ewald's law in man. With cupulometry we have been able to show in a large number of patients with one destroyed or damaged labyrinth that Ewald's law is only valid in 50% of the cases. A law about a fact being one way or the other which is true in 50% of the cases is the well-known law of pure coincidence.

In our opinion the vestibular apparatus, consisting of both labyrinths, vestibular nerves, centres and pathways, acts as an entity. Deviations from the normally symmetrical reactions may be found but from these it is impossible to localize the side of the lesion if there are no other data.

If the nystagmus after rotating in one direction has a longer duration than the nystagmus after rotating in the other direction a directional preponderance is present. With the test according to

Bárány this is the only answer that may be given. In cupulometry, however, it appears that two kinds of rotatory directional preponderance are possible. The first consists of a greater duration of the after-nystagmus in a particular direction following stimulation at all intensity levels. The nystagmus cupulograms thus run parallel.

The left curve indicates the direction of the directional preponderance, the distance between the curves indicates the intensity. If the rotatory directional preponderance is not too small the caloric test shows the same phenomenon. As the rotatory examination strongly points to the function of the canals, I cannot accept a utricular origin of this phenomenon as does Hallpike.

In a series of cases of neurological disturbances and especially of intoxication by streptomycin we found this type of directional preponderance. If the preponderance becomes stronger during the disease it leads finally to a spontaneous nystagmus; when the disease is cured the two lines come closer together and finally coincide. We had some clear cases where a spontaneous nystagmus disappeared but a directional preponderance remained, until this also vanished. It is a remarkable fact that after recovery the graph of the nystagmus is found to be exactly in between the previous graphs for rotating clockwise and anti-clockwise. This may indicate that the vestibular organ itself has preserved its own properties but is influenced by pathological processes in the neighbourhood.

There is, however, another form of rotatory directional preponderance which leads to the same difference in the test of Bárány but to a totally different course in cupulometry. In these cases the cupulograms are not parallel, the graphs for turning clockwise and anticlockwise diverge and even often cross each other. For small stimuli the difference is small or even reversed, for larger stimuli the difference becomes larger.

This type, in contradistinction to the first, is often found in peripheral disturbances of the labyrinth, in cases of predominance of the function of one labyrinth. Here also a spontaneous nystagmus may recover via this form of directional preponderance and here too, after healing, the reading of the nystagmus cupulogram is sometimes found in between the original graphs for turning clockwise and anticlockwise.

It is a remarkable fact that a dissimilitude of the sensation cupulograms is extremely rare and always of short duration. It is moreover always accompanied by spontaneous vertigo. Apparently the normal function of the labyrinth (sensation) is restored quicker than the abnormal function (nystagmus).

This compensation which always follows peripheral disturbances after longer or shorter time is complete within physiological boundaries. The cupulograms become perfectly normal again and no trace is found of Ruttin's shortening of the after-reactions after destruction of one labyrinth. This compensation with shortening according to Ruttin is only found when too big stimuli are given, as is the case in Bárány's test. So I quite agree with Hulk that Bárány's test is not a functional test but a loading test of the labyrinth. For normal purposes one labyrinth is capable of performing the work of two. But when heavy burdens are laid upon this one organ its insufficiency becomes apparent.

There is another important fact found by cupulometry. Bárány's test changes the function of the labyrinth. If a cupulogram either for nystagmus or for sensation is taken before and after a complete test of Bárány (10 rotations in 20 seconds, 3 times to the left and 3 times to the right) a great change in the form of the cupulogram is apparent which may last for days and even weeks. On the other hand the form of a cupulogram may be reproducible very precisely if over-stimulation (more than 60°/sec.) is avoided.

Though we do not know exactly the meaning of these changes in the cupulogram, caused by the Bárány test, we consider that an examination by which the function of the examined organ is changed is of questionable value and should be rejected if other methods are at hand. Cupulometry gives more information than Bárány's test. It is harmless, and gives us an impression of the total physiological function of the labyrinth. The given stimulus is known exactly. The only drawback of the test is that it takes at least twenty minutes, and a good deal of training, to make a complete cupulogram for one pair of semicircular canals.

Cupulometry has not yet been used enough to reveal the whole range of its possibilities. Some investigations (Hulk, 1949) in neurological patients, in otosclerosis and fenestration, in pilots (Krijger, 1952) and during streptomycin intoxication have been described and the results are very promising. In many cases cupulometry has been the only examination which made the clinical picture clear or gave an objective basis for subjective complaints. It takes longer but it gives the examiner twice as much information.

Conclusion

An examination of the vestibular organ cannot be too complete. Every special test has its own shortcomings and advantages. The entire vestibular pattern is illustrated in the clearest way if one examination complements the other. The observation of spontaneous deviations teaches us about the condition of the entire patient; the caloric test gives us the condition of the labyrinths, apart from and in relation to each other. The rotatory test finally may acquaint us with the physiological possibilities and properties of the vestibular system.

Prior importance cannot be accorded to any one method of examination. All are indispensable. If they are used critically and with a good technique we may hope thereby to re-establish confidence in our system of vestibular diagnosis.

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Mr. T. A. Clarke: Small-stimulus rotatory cupulometry is a beautiful thing but rotatory tests still have to prove their value in clinical otology; it still appears that they fail to answer definitely the crucial questions, which labyrinth is affected and how much.

In all the labyrinth tests the latent period of nystagmus cannot be taken as indicative of the degree of vestibular sensitivity, Professor Jongkees states, for nystagmus is essentially biphasic and is not recognizable until the quick corrective movement develops, which movement is not vestibular but belongs to the higher centres. With equal justice the same can be applied to the end-point of nystagmus which would seem to be, in part, a measure of the power of the cortex to control the vestibular deviation. This would certainly seem to be the case when ocular fixation is permitted, as is usual in this country; the intelligent patient fixing his gaze on the mark on the ceiling will achieve fixation and the ending of nystagmus more quickly than a dullard or a patient less concerned to follow instructions. This suggestion would seem to be borne out in a recent paper on anxiety neurosis patients [1] in whom, in general, a prolonged nystagmus was evident. It seems likely that this was not a measure of excessive vestibular sensitivity but rather of poor cortical control; disturbed by conscious and subconscious anxiety, higher centres were slow to control a normal vestibular deviation.

The cupulograms shown by Professor Jongkees afford an observation of the greatest interest that, both in rotatory and thermal tests, some cupulograms showed parallel lines, some converging or even crossing lines; that is to say, in the latter small stimuli elicited a weak response but as the strength of the stimulus increased the response came close to or even exceeded the normal. This phenomenon might well be called vestibular recruitment, analogous to cochlear recruitment. Moreover, it appears that the parallel lines are found in retro-labyrinthine lesions, the converging lines in end-organ disease; the analogy with cochlear recruitment is thus complete. But an essential feature in the demonstration of cochlear recruitment is use of interrupted stimuli [2], the intervals permitting the appearance of normal "on-effects"; continuous stimuli, as in the attempted simultaneous loudness balance test, failed to show recruitment. Now, from Professor Jongkees' observations, it seems that continuous stimuli (for rotatory and thermal tests must give continuous stimuli) applied to the labyrinth in suitable cases elicit the recruitment phenomenon. Two organs, cochlear and vestibular, in the same anatomical space, both show recruitment when the disorder is in the end-organ and not when it is situated proximally. If the observations are confirmed it would seem likely that there is a common explanation and a most interesting field for further investigation is opened.

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Mr. Cawthorne said that the caloric tests had always been found very useful at Queen Square, where they were always carried out by himself, Mr. C. S. Hallpike, Dr. M. E. Dix or others well trained in the work. Under these conditions the tests gave very reliable results.

Mr. C. S. Hallpike said that one point which had not been made quite clear by Professor Jongkees concerned the rationale for doing the caloric tests according to the technique which Fitzgerald and he had prescribed. Professor Jongkees had said that the purpose of doing the tests in this way was in order to recognize the phenomenon of Directional Preponderance. Here he quite agreed with Professor Jongkees but he disagreed with him when he then proceeded to weaken his argument by stating on statistical grounds that the phenomenon in question was generally no more than a normal variation commonly encountered in normal subjects. In a statistical study carried out upon more ample material than that of Professor Jongkees, he and his collaborators (Hallpike C. S., Harrison, M. S., and Slater, E., 1951, *Acta Oto-Laryng.*, **39**, 151) had shown that the limits within which the phenomenon occurred in healthy normal subjects were quite narrow.

Upon this statistical basis they might, therefore, expect that directional preponderance, when it occurred, would have some useful clinical significance and this expectation was certainly fulfilled by their experiences at Queen Square. He could say that when they observed a directional preponderance to one side or the other, its presence and direction were nearly always related in a physiologically appropriate manner to some unilateral vestibular lesion for which there was other clinical or post-mortem evidence.

It was, therefore, the view of himself and his associates that the purpose of carrying out the cold and hot caloric tests was the demonstration of directional preponderance in the expectation that when so demonstrated it would have some useful clinical significance.

Professor Jongkees, in reply, said that he agreed with Mr. Clarke that the duration of the nystagmus was influenced to some extent by the mental state of the individual, although he did not regard this influence as very great.

He agreed with Mr. Hallpike on the essential need for carrying out the caloric test with both hot and cold water. Mr. Hallpike had misunderstood him as regards the clinical importance of directional preponderance. What he had wished to stress was that this might be found in normal persons, and should not, therefore, be considered out of its proper place in relation to the whole clinical picture. He had been reminded of the difference between his own caloric test findings and those of Mr. Hallpike and his collaborators in normal subjects. This difference might, he suggested, be due to the fact that in the latter's investigation a selected group of healthy young men had been used.

Recording of Responses from Individual End-organs of the Vestibular Apparatus

By Otto Lowenstein, Dr.phil., Ph.D., D.Sc., F.R.S.E.

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A critical review of the extensive literature on the equilibrium function of the vertebrate labyrinth (Lowenstein, 1936) showed that up to that time investigations in this field had dealt with the effect of surgical injury to the labyrinth and its effect on the known reflex responses of body, limbs, and eyes to rotation and tilting. This evaluation of "deficiency" phenomena led to the establishment of the classical theories of labyrinth function, which formed the backbone of general physiological and specialized clinical and otological opinion in this field of sense physiology. The method of the "elimination experiment" so widely used in experimental physiology is limited in its usefulness by the indirectness of approach. It was therefore not surprising to find a considerable number of open problems and contradictions, the elucidation of which could only be achieved by a more direct approach. With the elaboration by Adrian and his school of the method of oscillographic recording of action potentials from sensory nerves such a direct approach became possible and has been the chief method used in a series of investigations dealing with a number of such open questions of labyrinth physiology.

The first problem attacked concerns the mode of function of the semicircular canals of the vertebrate labyrinth (Lowenstein and Sand, 1936).

It was found possible in the spinal dogfish to record directly from the branch of the VIII nerve supplying the ampulla of the horizontal semicircular canal, while the entire animal was subjected to rotation tests on a turn-table. Thus, for the first time in the history of labyrinth physiology, direct evidence became available concerning the mode of function of a component part of the complex vestibular organ. This led to the settlement of the controversial question of uni- *versus* bi-directionality of semicircular canal response. It could be shown that the canal response to angular acceleration is inherently bi-directional and, what is more, the intimate mechanism of this response could be clearly demonstrated. It was found to be based upon the presence in the "resting" animal of a spontaneous discharge of action potentials, the frequency of which can either be increased—in the case of the horizontal canal—by ipsilateral or decreased by contralateral acceleration. The functional significance of such a resting discharge in this clear-cut case helped in furnishing sense physiology with a concept which has by now become a universally accepted principle of sensory function in general. The demonstration of a continuous influx of afferent discharge from the labyrinthine sense endings raised anew the question of the tonic function of the labyrinth and the disputed role of the semicircular canals as a source of tonus. This tonic function of the semicircular canals could be established by elimination experiments in the pike labyrinth (Lowenstein, 1937), where it was found possible to sever by operation the nerve branch supplying the horizontal semicircular canal, and to demonstrate in the surviving animal the existence of well-circumscribed, lasting tonus asymmetries of the eye-muscle apparatus. The eye reactions of such a pike during and after rotation were found to be in complete agreement with the electrophysiological properties of the ampullary sense organ of the dogfish.

It was, of course, desirable to extend the functional analysis to all three pairs of semicircular canals The problem of access to the nerve twigs supplying the various ampullæ led to the elaboration of the new technique of the "isolated labyrinth preparation". Control experiments had shown that the labyrinth of an elasmobranch fish remains functionally active for a matter of hours after an interruption of the blood supply. Thus it became possible to work on a labyrinth contained in a part of the isolated skull of the ray (*Raja clavata*), a method which opened up many chances for analysis such as described in a paper on the individual and integrated activity of the semicircular canals of the elasmobranch labyrinth (Lowenstein and Sand, 1940*a*). The basic mechanism for canal function was confirmed for all six canals and the precise delimination of function in the interaction of the various canals during rotation in all planes of space could be mapped out. These findings could also be correlated with the known facts concerning the vestibular eye-muscle reflexes in vertebrates.

So far, recordings had been taken from the whole of the nerve branches supplying the sensory structures (cristæ) of the canal ampullæ. Such records of massive impulse discharges give valuable qualitative information. But for the purpose of quantitative analysis of the stimulus-response relationship in a sense organ, impulse records have to be obtained from single sensory units within a certain organ. The study of the responses from such single-fibre preparations to angular accelerations and rotations at constant speed were carried out in the isolated labyrinth of the ray (Lowenstein and Sand, 1940*b*) and led to a quantitative description of the behaviour of the cupula terminalis in the canal ampulla, which put on a safe basis the disputed torsion-pendulum theory of the cupular function. Thus, the sensory activity of the semicircular canal was found to provide a framework adequate to account for the time-relations of nystagmus and after-nystagmus, as utilized in the clinical analysis of vestibular defects (Lowenstein, Groen, and Vendrik, 1952).

The successful application of the method of the isolated labyrinth combined with the single-unit recording from individual vestibular nerve branches encouraged a still more ambitious research programme concerning the function of the less accessible and infinitely more delicate otolith organs of the labyrinth. A whole host of conflicting experimental and theoretical evidence obtained from representatives of the various vertebrate classes renders this the most obscure chapter of labyrinth physiology (Lowenstein, 1950). Fortunately, it was found possible to gain sufficient access to the nerve branches supplying the otolith organs in the isolated labyrinth preparation to obtain satisfactory single-unit recordings from all three otolith organs and to study the quantitative stimulus-response relationships, and the interaction of the three organs during changes of spatial orientation (Lowenstein and Roberts, 1950). It could be demonstrated that all three otolith organs, viz. the utriculus, sacculus, and lagena participate in the maintenance of equilibrium. Sense-endings in the maculæ generally show a resting discharge, the frequency of which is increased or decreased by positional changes. The functional ranges of *utriculus* and *sacculus* overlap. Both contain sense-endings responding to lateral and fore-and-aft tilting. There are two main types which have their maximum of discharge activity in Side-up and Nose-up and Side-up and Nose-down positions respectively. Organs having a maximum in the Side-down position were encountered, but did not appear among the position-receptors proper. Apart from "static" position-receptors, the maculæ contain receptors responding to a change of position in one and the same manner, irrespective of the direction of the change. They are described as "out-of-position" receptors. The receptors in the *lagena* also respond both to lateral and to fore-and-aft tilts. They have their maximum of activity usually in or near the normal position and can be described as "into-level" receptors.

During the analysis of the equilibrium function of the otolith organs it became apparent that, apart from responding to changes in the direction of gravitational pull, some of the structures also respond to vibrational stimulation. A detailed study of the vibrational responses (Lowenstein and Roberts, 1951) led to results which can be summarized as follows:

Vibration responses in the form of impulse discharges can be recorded from nerve twigs leading from part of the macula sacculi, the macula neglecta, and the lacinia of the macula utriculi of the isolated elasmobranch labyrinth. The otolith-bearing part of the macula utriculi, the posterior portion of the macula sacculi and the adjoining macula lagenæ do not respond to vibrational stimuli. They contain gravity receptors only. An appreciable number of the sense endings show a resting activity in the absence of vibrational stimulation. There exists, however, convincing evidence that, at any given time, many sensory units are quiescent. These can be recruited to take part in the vibrational responses, and they show a considerable range of thresholds. Under the obtaining experimental conditions vibration responses were recorded to stimulus frequencies extending rarely higher than 120 cyc./sec. Vestibular microphonics were observed up to a signal frequency of 750 cyc./sec. but only responses in the form of nerve impulse discharges were accepted as evidence for vibration sensitivity. At low-intensity stimulation the response consists of an increase in the discharge frequency of the "spontaneously" firing units. Higher intensities lead to the recruitment of previously quiescent sense endings and to a marked synchronization of the response frequency with that of the stimulus. This synchronization closely resembles the responses described for the mammalian cochlea, where it occurs at the lower end of the audible spectrum. Adaptation to sustained vibrational stimulation and a "silent period" after cessation of prolonged stimuli have been observed and the latter has been quantitatively analysed. It can be claimed that the theoretical implications of these results may be of considerable importance in relation to the problems of the evolution of hearing and pitch discrimination in vertebrates.

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Section of Orthopædics

President—PHILIP WILES, M.S., F.R.C.S.

[*December* 4, 1951]

Cystic Degeneration of the Medial Meniscus.—H. H. KENNEDY, F.R.C.S., *Lord Mayor Treloar Hospital, Alton, Hants.*

Cystic degeneration of the medial meniscus is usually considered to be a rare condition. In a series of 1,133 menisectomies Smillie (1946) recorded only 4 cases. In our own series of a little over 350, 5 cases were encountered and a sixth, excluded statistically as being a selected case, is also described.

The majority of cystic conditions on the inner side of the knee are diagnosed as ganglia or subsartorial bursæ; it is the purpose of this paper to suggest that the majority of these "ganglia" are, in fact, cysts derived from the periphery of the medial meniscus and to describe a simple means of demonstrating this deeper origin.

It is usually the superficial portion of the cyst which is noticed and its deeper origin neglected. In addition to demonstrating the deep origin of the cyst a method of visualizing its relation to the ligament is of value in planning the operative approach when undertaking menisectomy, which should follow the making of the diagnosis.

A method of investigtion which has been used in 5 cases (the last 4 in the series and the additional selected case) has been the aspiration of the cyst followed by instillation of 35% diodone and X-ray in A.P., lateral and oblique views.

In 4 cases the cyst investigated was present on the inner side of the knee in miners whose ages varied from 27 to 39 years. In all, the swelling had been present for several months and each case was aspirated and opaque medium injected. In one case the opaque medium, in addition to outlining the cyst, also filled a portion of the posterior horn of the meniscus.

In all these 4 cases the operative specimens closely conformed to the visualized shape and connexion of the cyst as shown in the X-ray.

The fifth case was that of a woman in whom the upper margin of the cyst was 1 in. below joint line and lying over the subcutaneous surface of the tibia. The opaque medium penetrated up to the knee-joint and burst through the fibrillated cartilage and was visible in the synovial cavity of the knee-joint itself.

The case illustrated was the youngest in the series, a boy of 7½ years, who had a large cystic swelling on the inner side of the knee for one year. The X-rays clearly showed this to be a superficial cyst with a deep connexion. The photograph of the specimen shows how this shape corresponds well with the expected findings despite puncture during operation. (*See* Figs. 1 and 2, p. 137.)

There have been no complications in any of these cases and in the case illustrated and that of the woman it seems unlikely that the origin of the cyst from the meniscus would be correctly diagnosed pre-operatively.

REFERENCE.—SMILLIE, J. S. (1946) Injuries of the Knee Joint. Edinburgh.

Fractures of Neck of Femur following Irradiation of the Pelvis.—R. C. S. POINTON, M.A., M.B., B.Ch., and T. B. SMITH, M.B., F.R.C.S., *University College Hospital, London, W.C.*1 (Introduced by C. W. FLEMMING, O.B.E., F.R.C.S.).

The occurrence of fracture of neck of the femur as a result of X-irradiation of the pelvis for malignant disease is an uncommon but well-recognized complication.

At University College Hospital 4 cases have occurred, 1 of whom sustained bilateral fractures of the femoral neck. These patients all suffered from carcinoma of the cervix and were treated by identical techniques. These 4 cases occurred out of several hundred treated similarly for the same disease, a much higher percentage incidence than that of traumatic fracture occurring in equivalent age groups of the general population.

Of the 4 cases at U.C.H. 2 suffered from Stage II and 2 from Stage III carcinoma of the cervix uteri. Each case was treated as follows:

Three insertions of intracavitary radium after the Stockholm technique were made and this was followed by a course of deep X-irradiation to the pelvis. Six fields were used, which were 20 × 10 cm. in size, two anterior oblique fields, two lateral fields and two posterior oblique fields. The physical factors used were 220 kV. F.S.D. 50 cm. H.V.L. 2·35 mm. Cu. One field was treated daily and each field was given 2,500 r over six weeks.

It has proved difficult to define the amount of X-ray energy absorbed by the femoral neck owing to the difference in capacity of bone for absorbing energy compared with soft tissues. From the arrangement used the majority of the irradiation of the femoral neck came from the lateral fields combined with some scatter from the other fields.

The course of these patients following their treatment may be summarized as follows: Their ages when first treated ranged from 57 to 66 years; after an interval which ranged from three to fourteen months, they complained of vague pain in the affected hip and on that side of the pelvis. The pain was never very severe and travelled down the lateral aspect of the thigh to the knee. It was never severe enough to incapacitate them and for some time there was no interference with the function of the affected hip. At the onset of these symptoms a local recurrence in the pelvis was suspected but none was found nor have they had any recurrence of their original disease. X-rays of the pelvis were taken and either showed nothing, or what now can be seen to have been a fracture of the femoral neck, was not recognized. After an interval of seventeen to thirty-seven months after the completion of X-ray therapy, clinical examination and roentgenograms revealed easily recognizable fractures of the femoral necks .

A typical case was that of a woman, aged 57, who was found to have a carcinoma of the cervix Stage II on 28.2.45. This was treated as described. Following treatment she remained free of gynæcological symptoms until August 1946 (fourteen months after completion of therapy) when she noticed pain down the front of the left thigh. On 18.10.46 examination revealed some limitation of rotation of the left hip, and X-ray revealed a fracture of the left femoral neck and no evidence of metastases (Fig. 1). Further X-ray on 8.11.46 (Fig. 2) reveals that fracture is more pronounced. Three months later she had 1½ in. of shortening of femoral neck with wasting of thigh muscles. All movements were limited. X-ray (Fig. 3) shows well-marked subcapital fracture. There was no evidence of avascular necrosis of the femoral head.

This lady declined surgical treatment of her fracture and of these 4 cases only 1 accepted surgical treatment.

This patient, aged 59, was treated in 1945 for carcinoma of the cervix uteri. Treatment was begun in November and consisted of three insertions of radium followed by a course of deep X-ray therapy between February and March 1946.

After treatment she attended the follow-up department of the hospital and remained free of recurrence.

In March 1947, a year after completing treatment, she twisted her right ankle. This did not bother her very much but five days later she developed pain in the right hip and thigh which caused her to limp and severely limited her activity. The pain persisted at night and kept her awake.

An X-ray was taken of the hip two months later. No evidence of bony metastasis was seen in the film, but it can be seen that there is some deformity in the subcapital region on the right side, which was not recognized (Fig. 4).

At this time she had a severe limp with a positive Trendelenburg sign on the right side and marked wasting of the quadriceps. There was a full range of movements in the hip-joint. She was referred to the Physiotherapy Department for treatment. She derived little or no benefit from physiotherapy although she continued under treatment until December 1947. The pain became gradually more severe until by April 1949 she was unable to walk more than 100 yards.

Examination showed considerable limitation of all movements in the right hip-joint with about 1 in. of shortening of the leg. An X-ray taken at this time showed an obvious old fracture of the femoral neck (Fig. 5).

She was referred to the Orthopædic Department of the hospital. On July 5, 1949, the right hip-joint was exposed through an antero-lateral incision by Mr. C. W. Flemming. At operation the capsule was found to be extremely thick and rather gelatinous. The joint contained a considerable amount of viscid yellow fluid and the bone of the head was very soft and spongy. After dislocation of the head, bone was removed until apparently healthy bone was reached. Fixation was secured by passing a trifin nail up the neck and into the pelvis through a separate lateral incision.

Following operation she became free of pain and eventually got about quite well with the aid of sticks. An X-ray taken in September 1949 appeared to show bony union to be progressing satisfactorily. It can also be seen on this film, although it was not recognized at the time, that there is a break in continuity of the cortex in the lower aspect of the left femoral neck in the subcapital region (Fig. 6).

In April 1950 she developed a severe pain in the lumbar spine, left hip and thigh radiating to the knee which made it almost impossible for her to walk, and she became bedridden. There was no preceding history of injury.

She was seen a month later when examination caused severe pain but there was flexion to 45° and a few degrees of abduction in the left hip-joint. The arthrodesis of the right hip was not sound but the few degrees of movement which were present were painless. X-ray showed a subcapital fracture

(Continued on p. 137.)

FIG. 1.

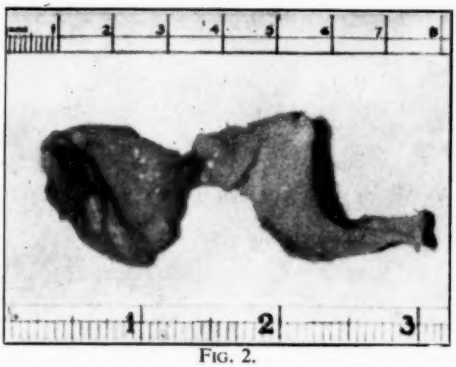

FIG. 2.

FIG. 1.—Cyst of medial meniscus visualized following installation of diodone, showing deep connexion.
FIG. 2.—Operative specimen. (Mr. H. H. Kennedy's case. *See* text p. 135.)

FIG. 1.

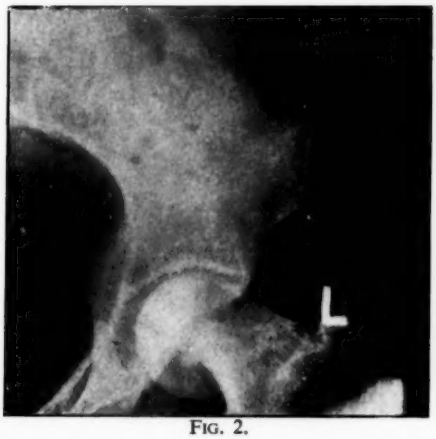

FIG. 2.

FIG. 1 (October 1946). —Subcapital fracture of femoral neck (seventeen months after completion of X-ray therapy).

FIG. 2 (November 1946). —The subcapital fracture is now more pronounced.

FIG. 3.

FIG. 3 (January 1947). —Well-marked subcapital fracture of femoral neck.

(*See* text, pp. 135–136, R. C. S. Pointon and T. B. Smith.)

FIG. 5 (May 1949).—An obvious old fracture of right femoral neck.

FIG. 7 (May 1950).—Subcapital fracture of the left femoral neck.

FIG. 4 (May 1947).—Early subcapital fracture of right femoral neck.

FIG. 6 (September 1949).—Arthrodesis of right hip. There is a break in the continuity of the cortex in the lower aspect of the left femoral neck in the subcapital region.

of the left femur (Fig. 7).

It was decided to attempt to stabilize the arthrodesis of the right hip and to perform an arthroplasty on the left hip.

On July 6, 1950, the nail was removed from the neck of the right femur and a graft of the left fibula was hammered up the nail track into the pelvis. A further nail was inserted above and parallel to the graft. A plaster spica was applied at the end of the operation.

A month later while the right leg was still in the spica the left hip was exposed and a Girdlestone arthroplasty was performed, the head and neck of the femur being removed. Weight-bearing was commenced seventeen weeks after the first operation and by February 1951 she was getting about well on elbow crutches and was completely free of pain.

That these fractures are a sequel of the pelvic irradiation is accepted. The assumption is that the fractures are due to vascular changes producing localized necrosis of the osseous tissues. Truelsen, from a study of sections taken in his series of cases, suggests that the osseous changes may be due to the direct influence of the rays on the osteoblasts and osteoclasts of the osseous tissue. The problem presented for treatment in most cases is that of a subcapital fracture with a necrotic head. The blood supply of the femoral neck is also probably defective and the bone not sound.

In the specimen removed at the third operation there was no evidence of any metastasis. The fracture line was filled with a mass of fibrous tissue. There was almost a complete absence of any bone reaction to the fracture, the marrow was almost entirely fatty, a few small areas of normal marrow were present, the whole specimen was very avascular but the small vessels which were present appeared relatively normal. Most other cases which have had histological examination have shown hyaline changes in the walls of the vessels.

Since 1947 a different arrangement of fields for irradiating the pelvis has been used in cases of carcinoma of the cervix. Small fields and no lateral fields are used. Since the adoption of this method no case of fracture of the femoral neck has appeared. However, large fields are still used for other types of pelvic malignancy and hence more fractures may occur.

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The Relationship of the Hamstring Muscles to Movements of the Spine.—R. H. V. Hafner, F.R.C.S., *St. Peter's Hospital, Botleys Park, Chertsey.*

Short hamstring muscles are sometimes blamed for limitation of body flexion and the appearance of postural defects; furthermore Lambrinudi (*Brit. med. J.*, 1934 (ii), 800) considered them responsible for the occurrence of adolescent kyphosis. This paper is a study of the mechanism of flexion of the body in order to discover the part, if any, played by the hamstring muscles in limiting this movement.

The ability to touch the toes with the knees straight is a feat which shows marked variation in normal individuals. The discovery that one can or cannot do this is usually made during kindergarten gymnastics when the class becomes roughly divided into two groups: those who can touch the toes easily and those who cannot do so or only with difficulty. When the latter group try to increase their range of flexion pain is experienced at the back of the knees because the hamstring muscles are overstretched and feel taut on palpation. It is not surprising, therefore, that the hamstring muscles were blamed for this limitation of flexion and that this group of people were thought to be suffering from short hamstring muscles.

In forward bending movement takes place mainly at two sites: one is rotation of the pelvis at the hip-joints, and the other is flexion of the lumbar spine. Radiological studies allow one to observe this more easily and also to measure the amount of movement taking place at each site.

If this is done in a series of normal individuals it can be shown that in those patients whose body bending is poor the limitation lies mostly in the lumbar spine and that the proportion of movement taking place at the hip-joints is in fact increased in these cases.

Lateral views of the spine and pelvis are taken firstly erect and secondly with the maximum forward bending which can be obtained by active body flexion. Lumbar movement is obtained by measuring the change in the lumbosacral angle from the upright to the flexed posture. Flexion of the lumbar

(*Continued on p.* 142.)

Patient "A"

FIG. 1.

FIG. 2.

FIG. 3.

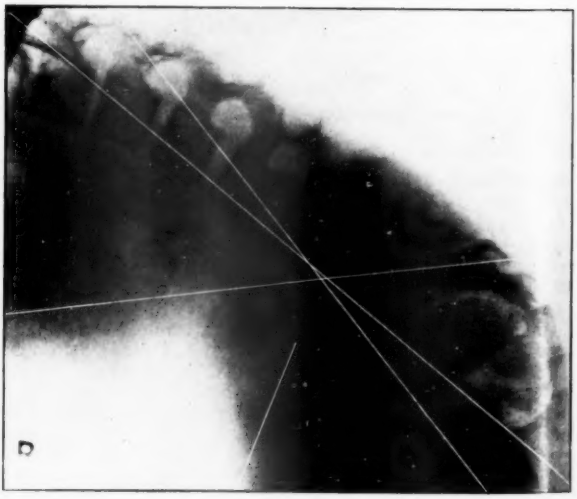

FIG. 4.

Photographs and X-rays of patient "A" taken firstly upright (Figs. 1 and 2) and secondly with the maximum body flexion obtainable with the knees straight (Figs. 3 and 4).

(The explanation of the double lines drawn along the lumbar spine is that the X-rays reproduced here are part of a series in some of which the poor definition of the films precludes taking an accurate marking in the upper lumbar region.)

Patient "B"

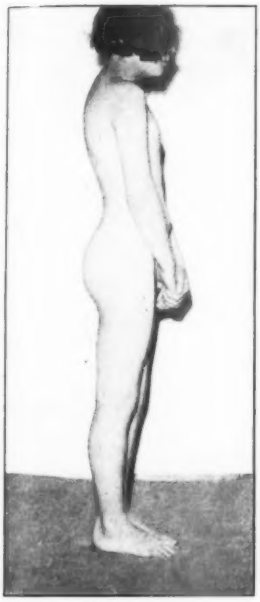

FIG. 5.

FIG. 6.

FIG. 7.

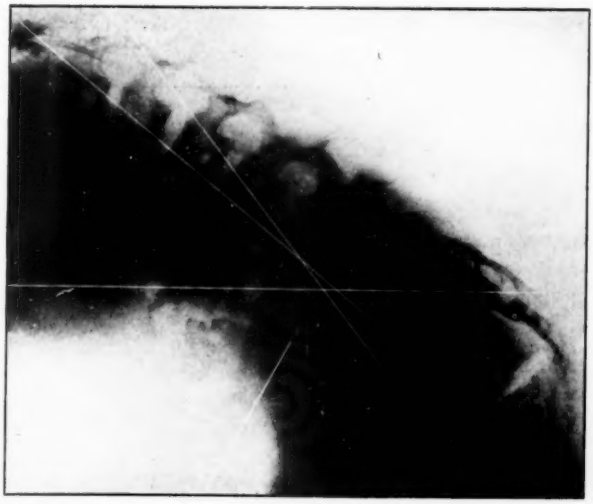

FIG. 8.

Photographs and X-rays of patient "B" taken firstly upright (Figs. 5 and 6) and secondly with the maximum body flexion obtainable with the knees straight (Figs. 7 and 8).

spine, however, is a gradual process in which all the lumbar vertebræ take part and in order to measure total lumbar movement one must include all the lumbar vertebræ. Pelvic movement is obtained by measuring the angle of rotation of a given surface of the sacrum in relation to a constant line. In this case the superior surface was used and the line was provided by a metal bar in a fixed position in front of the casette.

The difference in the two groups is manifest in activities other than forward bending: sitting up in bed with extended legs is a pleasure denied to the less mobile group as is the ability to raise the straight leg to a right angle when lying supine. Efforts to perform these feats result in pain from stretching of the hamstring muscles which tend to receive the blame for the disabilities. A side view of a representative of each of the groups sitting up with extended legs reveals that it is the lumbar spine which is the limiting factor and this is confirmed radiologically. At first sight it is not so apparent that the lumbar spine is the limiting factor in straight leg raising in the supine position—the mobile group reach an easy 90 degrees and the others lag behind with only 70–80 degrees. If, however, lumbar movement is eliminated by placing a firm object beneath the lumbar spine then straight leg raising is at a uniform height of about 70–80 degrees.

Adults do not regard inability to touch the toes with the knees straight as an indication for treatment and so they only present themselves as patients when the stiffness is associated with a spinal lesion and pain is the dominant feature. Children on the other hand are frequently referred from school clinics because of "bad posture" or limitation of forward bending. In attempting to classify such children those whose stiffness is due to a demonstrable lesion of the spine must first be excluded. These include inflammatory and neoplastic lesions; congenital defects such as spondylolisthesis; and prolapsed intervertebral discs. The last, although much less common than in adults, is by no means rare. Having excluded the abnormal we are left with a group of children whose shape differs from the average because of increased or decreased lumbar lordosis, the former being compensatory to an increased forward pelvic tilt or excessive dorsal kyphosis, and the latter a decreased pelvic tilt or reduced dorsal kyphosis.

Children who can touch their toes easily vary in the proportion of lumbar to pelvic movement they use in so doing. In some lumbar and in others pelvic movement predominates. However, if those of the former group are subjected to the straight leg raising test their hamstring muscles are found to be of normal length. The explanation of this variability would appear to be the great mobility of the lumbar spine and pelvis in some children so that toe-touching can be performed without stretching either the lumbar spine or the hamstring muscles to the maximum.

In the case of children who have difficulty in touching their toes, however, the lumbar spine is found to be the limiting factor. This is shown in Figs. 1–8, photographs and X-rays of two children, "A" who could touch her toes easily and "B" who could not. The measurements are recorded in Table I.

TABLE I

Combined lumbar and pelvic movement		Lumbar flexion	Pelvic rotation
"A"	80 degrees	58 degrees (72%)	22 degrees (28%)
"B"	71 degrees	45 degrees (63%)	26 degrees (37%)

SUMMARY AND CONCLUSION

(1) The mechanics of forward bending in children and adults have been studied in order to discover the relationship of the hamstring muscles to this movement.

(2) Although normal individuals vary considerably in their range and mechanism of body flexion those whose forward mobility is less than average are limited by stiffness of the lumbar spine rather than shortness of the hamstring muscles.

(3) If short hamstring muscles did occur in infancy or childhood then one would expect children with this defect to become adults having hypermobility of the lumbar spine and reduced pelvic rotation. Such a pattern of movement is not found in my experience.

(4) If short hamstring muscles and the increased strain on the spine they occasioned in forward bending were indeed responsible for the development of adolescent kyphosis, then one would expect the lesion to occur in the lumbar spine, the site of maximum flexion, rather than the dorsal region.

(5) If it is true that Scheuermann's lesion of the spine does result from trauma to the intervertebral discs during forceful flexion, its occurrence in the dorsal region may be due to a stiff lumbar spine throwing an increased strain on that area.

I wish to thank Mr. B. H. Burns and Mr. R. H. Young for their encouragement and the Radiological Departments at St. Peter's Hospital, Chertsey, and St. Bartholomew's Hospital, Rochester, for their assistance in the preparation of this paper.

PLATE I

FIG. 1.—Demonstrates a hairline filling in the popliteal artery. This is a normal variation which may be due to a surface tension phenomenon. Note that the vessel maintains its normal calibre.

FIG. 2.—Shows extensive recanalization of thrombus in the popliteal artery. This appearance was constant on two successive radiographs.

(*a*) (*b*)

FIG. 3.—(*a*) Shows an extensive thrombosis of the femoral and popliteal arteries. The thrombosed portion was excised. (*b*) Shows the appearances about two years later. Although the collaterals are tortuous, their course is direct and apparently purposeful.

FIG. 5.—Shows large and numerous collateral channels following femoral thrombosis with inadequate filling of the tibial arteries (cf. Fig. 4).

FIG. 4.—Extensive thrombosis of the femoral artery, with comparatively few collateral channels. In spite of this, the lower leg shows good filling of the tibial arteries (cf. Fig. 5).

Section of Radiology

President—JOHN WILKIE, M.Sc., M.B., F.F.R., D.M.R.E.

[*October* 19, 1951]

Radiology in Peripheral Arterial Disease

PRESIDENT'S ADDRESS

By JOHN WILKIE, M.Sc., M.B., F.F.R., D.M.R.E.

THE radiological study of the cardiovascular system has been very much to the fore of recent years. Indeed, ever since the introduction of diodone as a safe, although perhaps not ideal opaque medium, considerable advance has been made in the demonstration of cardiovascular lesions, such as congenital abnormalities of the heart and great vessels. In the field of neurology, percutaneous carotid angiography will often show accurately, not only the position and size of an intracranial tumour, but may also give some idea as to its pathology and accessibility. Since neurosurgery demands an accurately planned approach, such information is important. Abdominal aortography seems likely to prove of value in some of the more obscure intra-abdominal lesions. Can peripheral arteriography make a similar contribution to the diagnosis and treatment of peripheral vascular lesions? The question is important, especially in a population where the proportion in older age groups is increasing and where consequently arterial disease is likely to increase.

This communication is based on the study of 142 cases of arterial disease in the lower limbs, occurring between 1947 and 1950. These are made up as follows:

Total	142
Arteriosclerosis	87
Thrombo-angeitis	36
Unclassified	5
Cases showing no evidence of arterial disease ..	14

The series includes 46 cases published by Jones and Steiner (1949) and, among other investigations, all were submitted to arteriography.

This is only one of several methods available for the study of peripheral vascular disease. The case history and a careful clinical examination enable the diagnosis to be established with a reasonable degree of accuracy and special methods of examination are usually confirmatory only.

TECHNIQUE OF ARTERIOGRAPHY

The technique of arteriography follows familiar lines. After injection of 20 c.c. of diodone, serial radiographs are taken of the whole length of the lower limb, from the bifurcation of the common femoral artery to the foot.

In the earlier cases, five radiographs were made in both antero-posterior and lateral projections, which involved two injections of diodone. By making exposures in the antero-posterior and lateral projections alternately, it has been found possible to obtain two projections at right angles of the arterial tree from hip to foot, with one injection only. Two mobile X-ray units are used, one for the anterior and one for the lateral projection.

The femoral artery is exposed under general anæsthesia and temporary hæmostasis established by underslinging the artery with a thin rubber band. By releasing this after the third exposure, the opaque medium is

tibial arteries (cf. Fig. 4).

leg shows good filling of the tibial arteries (cf. Fig. 5).

swept distally as a bolus and good films of the distal vascular channels are usually obtained. In our hands, the percutaneous method has been unsatisfactory, although it is widely used elsewhere, and the published radiographs appear to be satisfactory. The time between the first and last exposures is usually between thirty and thirty-five seconds, which allows the necessary changes of casette to be made without undue haste.

Clinical Aspects

In order to appreciate the problem of occlusive vascular disease it is necessary to consider some of its clinical aspects.

The most frequent symptom is intermittent claudication and it was present in no less than 128 cases of the 142. Lewis and his co-workers (1929) showed that the characteristic pain of intermittent claudication is due to the production of metabolites which contain a pain-producing factor. Only where the blood supply is inadequate do these metabolites accumulate and so cause pain.

In thrombo-angeitis, cramp-like pains may occur in the feet due to thrombosis of the lower parts of the tibial arteries. These may be mistaken for foot strain, and occasionally the true nature of the disease is only revealed by the onset of gangrene in the toes.

The more objective manifestations of peripheral vascular lesions include colour changes in the skin which may be permanent or temporary. The measurement of the effects of temperature, posture and exercise upon these helps to assess the degree of vascular insufficiency, as does also palpation of the peripheral arteries.

The majority of the cases have been subjected to lumbar sympathectomy, with considerable improvement in the nutrition of the skin and toes, and in the exercise tolerance. Some, however, still complain of pain on walking and their activities are severely restricted.

An increase of walking distance from 50 to 100 yards cannot be regarded as a particularly gratifying result of operation, but a few say that they can walk two or three miles, provided they go slowly. Since many are in the sixth or seventh decade, such distances can be considered satisfactory. Of 128 cases with intermittent claudication, 81 still complain of pain after treatment, and 20 have been completely relieved. In 27 others, the result is unknown, since, for various reasons, no follow-up has been possible.

Sympathectomy will usually relieve the night cramps of arterial disease, and these may be so severe that the patient often demands relief at all costs, and even regards amputation as a price not too high to pay. A vivid description of the miserable condition to which victims of night cramps may be reduced is given by Allen, Barker and Hines (1946).

Classification of Peripheral Arterial Disease

In a large series of cases with circulatory deficiency, Boyd *et al.* (1949) reviewed the clinical and arteriographic findings, and classified them into three groups.

(1) Primary thrombosis of the popliteal artery.

(2) Juvenile obliterative arteritis.

(3) Senile obliterative arteritis.

Of these, the first two are usually grouped together as thrombo-angeitis obliterans, but the authors produce evidence to show that in nearly all their cases under the age of 35, the cause of thrombosis is traumatic. In these cases the popliteal is the only artery involved and the symptoms resolve leaving no residual signs. The other parts of the vascular tree are free from disease. No case in the present series fulfils these criteria, but there were only a few under the age of 35.

The distinction between the juvenile and senile types of obliterative arteritis is not always easy. Generally speaking, symptoms occurring in those over the age of 50 are ascribed to arteriosclerosis, and in those under 35 to thrombo-angeitis.

In the juvenile type, thrombosis begins in the small arteries of the feet and extends proximally. The disease is always bilateral and its rate of progress varies from case to case; amputation may be necessary three to five years after onset. In the senile type, there is diffuse narrowing of the lumen of the arteries and there is often thrombosis too. This is found in the larger vessels and spreads proximally and distally.

The precipitating cause of thrombosis is unknown but trauma may play a part. To determine the exact site of origin is impossible, but in the present study the indications are that it begins at the level of the opening in adductor magnus, where the liability to trauma is greatest. This agrees with the findings of Lindbom (1950).

Such simple methods of differentiation as those described above do not always suffice, for arteriosclerosis is sometimes seen in young adults and the first symptoms of thrombo-angeitis may occur much later than at 35.

Superficial venous thrombosis is an important sign of thrombo-angeitis, but careful search may be needed if evidence of this is not to be missed. The malign influence of tobacco in thrombo-angeitis and of diabetes as an accelerating factor in arteriosclerosis are too well known to need emphasis, and help to distinguish one group from the other. Nevertheless not every case can be assigned to one group or the other.

Normal Arteriogram

The normal arteriogram is characterized by the smooth outline of the main channels. The profunda femoris branch tapers fairly rapidly and gives off its perforating branches, which carry the main blood supply to the muscles. The vessels pursue a direct course from hip to foot.

There is a minimum of collateral branches and this helps to distinguish between the normal and the early changes of arterial disease, for the opening of collateral branches may be the only indication of early pathological changes. The arterial lumen diminishes gradually, to form a rich network of vascular loops in the foot. The blood flow is so rapid that the popliteal vein may be seen to be filled in those radiographs which also show opacification of the artery.

Variations of the normal occur. Spasm of the arterial wall due to irritation of the intima may cause a smooth narrowing of the lumen over a few centimetres. It can be likened to a length of glass tubing, the centre of which has been softened and drawn out to a capillary. The effect is temporary and restoration of the normal calibre is usually seen on the next radiograph. Another bizarre appearance is the thin thread-like effect, due either to gravity or a surface tension phenomenon (Plate I, Fig. 1).

Variations in diameter from one individual to another are common and are without pathological significance.

In studying the abnormal arteriogram, attention should be directed to the following points, which are a slight modification of the scheme suggested by Allen and Camp (1938):

(1) Alterations in contour.

(2) Thrombosis and diminution in calibre.

(3) The number and size of the collateral channels.

(4) The presence or absence of venous filling.

Alterations in contour are extremely variable. At one end of the scale, a small irregularity appearing in the otherwise smooth contour of an artery together with a few collateral branches, may provide the only radiological evidence of thrombo-angeitis, even when the clinical diagnosis is firmly established. The irregularity is due to a mural thrombus, but study of the arteriogram will not help in deciding whether it is newly-formed or resolving. At the other end of the scale is found the grossly irregular contour of advanced arteriosclerosis, which may affect the whole length of the arterial tree, and give it an outline not unlike a string of pearls.

In the larger arteries, thrombosis is easily recognized, and it may involve a considerable length of an artery. Its upper and lower limits are usually abrupt and marked by a fairly large collateral branch giving a kinked appearance to the artery. Below the knee, it may be difficult or even impossible to decide whether an artery is thrombosed or not. Filling may be inadequate on two successive radiographs, or the normal channel lost in a welter of collateral branches of much the same calibre. In no case in the series has it been possible to demonstrate occlusion of the dorsalis pedis or plantar arteries, thereby limiting the value of the procedure in cases of thrombo-angeitis.

Mural thrombi can give a bizarre outline to the artery. Half the lumen may be occluded for several centimetres of its length or recanalization of a thrombus may show several irregular channels running through the occluded portion and dividing the blood stream, like islands in the middle of a river (Plate I, Fig. 2).

The collateral branches are the most characteristic feature of the arteriogram in arterial disease. They vary in appearance, size and number. A large branch may arise from the profunda to bridge a thrombosed segment of the superficial femoral artery, and the small irregular branches are consequently few. On the other hand, there may be a very large number of small vessels. They cross and anastomose in a confusing but characteristic manner and terminate by rejoining the parent artery below the occluding thrombus, having pursued their apparently purposeless course.

Exceptionally, collateral branches appear to be more purposeful, as demonstrated by a case showing a leash of vessels formed in response to a local arteriectomy (Plate I, Fig. 3).

Demonstration of venous channels is unusual in established arterial disease. Jones and Steiner (1949) reported it only once in 37 abnormal arteriograms.

Good arteriograms will show:

(1) The position and extent of the thrombosis.

(2) The number and size of the collateral channels.

(3) Whether there is a large number of filled vascular loops in the foot.

In attempting to correlate the arteriographic and clinical findings, the position and extent of the thrombosis have been recorded in each case. The collateral circulation, and filling of the vessels in the lower leg and foot, have been assessed as poor or good. This is a matter of individual judgment and liable to considerable error, but has been adopted for simplicity.

Clinical evidence indicates that the chances of establishing an adequate blood supply to the foot are much greater when the thrombosis occurs above the knee than when the tibial arteries are affected. This is supported by the arteriograms, for, out of 26 limbs showing tibial thrombosis, the vessels to the lower part of the leg and foot appeared well filled in only 4. Chance, however, plays a part, for it is impossible to know beforehand, the exact moment at which the exposure should be made to demonstrate optimal filling.

Although it might be thought that the length of the thrombosed portion of the artery should bear a direct relationship to the degree of filling of the vessels beyond, this is by no means always the case, and the arteriogram may be misleading. Clinical assessment gives a more accurate indication of the condition than does the arteriogram.

The collateral channels which open in arterial disease are variable. Since they appear as a result of a demand for an increased blood supply, it is tempting to assume that their size and number will indicate their ability to supply this need. Unfortunately, this is not the case, for as the number and size of the hoses used in dealing with an outbreak of fire give no indication of the pressure and volume of water delivered, so the number and size of the collateral branches are no criterion of the blood supply (Table I and Plate II, Figs. 4 and 5).

TABLE I.—RELATIONSHIP BETWEEN COLLATERAL CHANNELS AND DISTAL FILLING

No. of limbs showing good collateral channels	81	No. showing good filling below the knee	56
		No. showing poor filling below the knee	25
No. of limbs showing poor collateral channels	69	No. showing good filling below the knee	20
		No. showing poor filling below the knee	49
Total	150		

The degree of distal filling of the Arterial Tree varies directly with the number and size of the collateral channels in about 65% of cases only.

Only when a radiograph of the region of the knee and upper leg shows well-filled venous channels (in the absence, of course, of any arteriovenous anastomosis) can it be assumed that the circulation to the lower leg and foot is adequate.

When amputation for gangrene has to be considered, arteriography can do little or nothing to help determine whether it should be done below or above the knee or whether it is necessary at all. The decision has to be made on clinical grounds and it is doubtful whether other special investigations, such as measurement of skin temperatures or estimation of circulation times, help much either.

In one or two cases in the series, a second arteriogram has been done some months after sympathectomy. Thereby it was hoped to find out whether operation had resulted in any demonstrable increase in the number of functioning vascular channels. The results have been disappointing. In one case a little increased "clouding" in the muscles of the sympathectomized leg was encouraging, but the demonstration of similar changes in the opposite leg proved the appearances to be without significance. Repeated examinations are probably not worth while, for the persistence of intermittent claudication after operation would itself suggest that sympathectomy does not materially increase the blood supply to the muscles. This in no way detracts from its value in relieving night-cramps, and in postponing or arresting gangrene of the toes or skin.

It was thought that arteriography might help in the classification of those cases which, from clinical examination alone, cannot be placed in either the juvenile or senile group of obliterative arteritis. Unfortunately, this hope has not been realized—cases which show equivocal clinical signs also give unreliable radiological appearances.

It becomes apparent, therefore, that arteriography has little to offer in the study of peripheral arterial disease. Whilst it will give fairly accurate indications of the site and extent of the lesion, it contributes little or nothing to the assessment of function, progress or prognosis. Indeed, it may be questioned whether the information it can give is commensurate with the time and trouble involved in the procedure.

To end in so gloomy a strain would be a grave disservice to the contribution which radiology has made to Medicine. There are fields where radiology of the peripheral vascular system may yet play a part. The influence of modern therapeutic measures on the blood supply of the arthritic joint, and the study of the vascular pattern in and around bone tumours, may prove profitable pursuits for the diligent and enquiring mind.

In conclusion, I wish to thank Professor E. J. Wayne and Mr. Clifford Jones for allowing me free access to their clinical material, and for their help and criticism.

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Clinical Section

President—HAROLD EDWARDS, C.B.E., M.S.

[*December* 14, 1951]

Constrictive Pericarditis Relieved by Pericardiectomy.—R. T. CAMPBELL, F.R.C.S. (for A. DICKSON WRIGHT, M.S.).

Mr. H. K., aged 39. Carpenter.

History.—Since 1947 gradually increasing ascites preceded by one month of pain in the lower part of the chest. Investigated in 1948; liver function tests within normal limits: total plasma proteins 7·5 grammes %, albumin 5·2% and globulin 2·3%. X-ray chest, slight enlargement of heart shadow. X-ray abdomen, barium swallow and meal uninformative. *September* 1948, *Laparotomy:* Liver congested. Splenomegaly with perisplenitis. Splenectomy and liver biopsy performed. Omentum implanted in rectus sheath. Histology of spleen and liver considered consistent with primary cirrhosis of liver.

FIG. 1.—February 1951. Neck showing venous congestion.

May 1950 developed incisional hernia. *September* 1950, *Laparotomy and repair of hernia:* 16 pints of ascites removed. Liver inspected and described as of classical Laennec's cirrhosis type. Gross ascites continued. 1.2.51: Referred to St. Mary's Hospital.

On examination.—Gross ascites with hard knobbly liver. Some swelling of ankles. No significant anastomotic veins. Pulse regular 80 per minute. B.P. 110/80. Neck veins full to angle of jaw (Fig. 1). Right hydrothorax. Girth of abdomen 41 in.

Investigations.—Biochemical tests showed good liver function. Serum proteins 10·3 grammes %, albumin 5·3%, globulin 5·0%. *Vital capacity* 625 c.c. *E.C.G.:* Low voltage with T waves flattened in all leads, and P–R interval 0·28 sec. *X-rays:* Chest: right pleural effusion. No calcification of pericardium. *Screening of heart:* normal amplitude of ventricular pulsation on left ventricular wall, but pulsation not evident on deep inspiration in region of apex, and undersurface of the left ventricle. Single adhesion to diaphragm seen near apex. *Kymogram:* Left border shows free pulsation, right border obscured by fluid. *Catheterization of right auricle:* central venous pressure plus 20 cm. water, falling on rest to plus 16 cm. water.

Pathological report (Professor W. D. Newcomb): Spleen and liver biopsy taken in September 1948. "*Liver*, marked central congestion with pseudo-lobulation in some places. There is also considerable fibrosis spreading from both portal systems and central veins. I should describe it as advanced passive congestion with moderate cardiac cirrhosis. *Spleen*, there is considerable fibrous tissue on surface of spleen capsule. The spleen itself shows advanced venous congestion with no obvious fibrosis. It appears to be a case of chronic passive congestion with perisplenic fibrosis due to some other cause."

18.6.51: *Operation* (Mr. A. Dickson Wright).—Pericardiectomy. Sternum split in mid-line to expose heart pulsating very poorly due to cuirass of fibrotic pericardium. The thickened pericardium overlying the ventricles was removed, one piece measuring 10 × 5½ cm. and the other 8 × 5½ cm. Some bleeding from region of apex where pericardium was thinner and line of cleavage poor. Controlled by muscle graft. Pulsations of heart greatly increased.

Post-operative course.—Transient jaundice, probably from transfusion. Spontaneous diuresis occurred seven days post-operatively and lasted for about a week. Progressive improvement in general condition and decrease of ascites.

Pathological report.—Dense fibrous thickening of pericardium, no evidence of active tuberculosis or rheumatism.

December 1951: General condition vastly improved and exercise tolerance greatly increased. Very little ascites demonstrable and abdominal wall lax and girth 33 in. Vital capacity 2,200 c.c. No venous congestion present.

Discussion.—This case is of interest for several reasons. The cause of the ascites remained undetected for three years despite the fact that the biochemical findings showed good liver function, the liver showed only congestion at laparotomy and sections of liver and spleen did not support a diagnosis of primary cirrhosis. The observation of venous congestion in neck was the clue to the correct diagnosis, and the raised venous pressure was confirmed by right auricular catheterization. Screening of the heart and kymography did not, however, support the diagnosis of constrictive pericarditis very strongly, for the left border showed free pulsation.

Before operation it was debated whether the ascites could be reversed in the presence of established cirrhosis of the liver, but these doubts were shown to be ill-founded and the ascites dwindled like magic following pericardiectomy. Undoubtedly one may expect greater recovery by the liver in secondary cirrhosis of the cardiac type. It is important to note, as shown by Katzin *et al.* (1939) that portal cirrhosis frequently accompanies central cirrhosis in the presence of chronic passive congestion.

An interesting speculation in this case is whether the perisplenitis had a common ætiology with the pericarditis.

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Congestive Cardiac Failure Treated with Ion-exchange Resins.—LEO GILCHRIST, M.D., M.R.C.P. (assisted by Miss V. A. L. BREWS (Biochemistry) and K. CITRON, M.D.).

G. S. C. Male aged 55. Admitted to Farnborough Hospital, Kent, on 24.4.51, with congestive cardiac failure, chronic bronchitis, and essential hypertension (B.P. 260+/150). This was his third admission to hospital in one year.

Treatment.—(1) *Control period* (7.5.51–30.5.51): Treatment with a salt-free diet, digoxin and mersalyl proved ineffective and he gained 3 lb. in weight.

(2) *Zeocarb* 225 (Permutit) (9.6.51–30.7.51): This is a strongly acid sulphone resin whose taste is difficult to disguise. In doses of 100 grammes per day it induced anorexia and the patient ate little except at breakfast time. On 15.6.51 the serum potassium fell to 3·35 mEq/L and this fall was corrected by giving 1 gramme of KCl daily by mouth. The patient's weight fell from 200 to 137 lb. and his œdema disappeared, but nausea, vomiting and hyperventilation with an alkali reserve of 18 mM/L on 30.7.51 forced us to stop the treatment.

(3) *Rest period* (31.7.51–13.9.51): No resin was given during this period. The serum potassium fell to 3·3 mEq/L on 3.8.51. 6 grammes of KCl were given daily from then until 9.8.51 when the dose was reduced to 1 gramme daily. The serum potassium rose to normal on 5.8.51 and a brisk diuresis occurred on 8.8.51 and continued for some days (*see* Fig. 1).

(4) *Carboresin* (Eli Lilly) (14.9.51–16.11.51): This resin is specially prepared to overcome the disadvantages of the strongly acid resins such as Zeocarb 225, these being the unappetizing taste and their tendency to produce acidosis and hypopotassæmia. It is a flavoured mixture of carboxylic acid

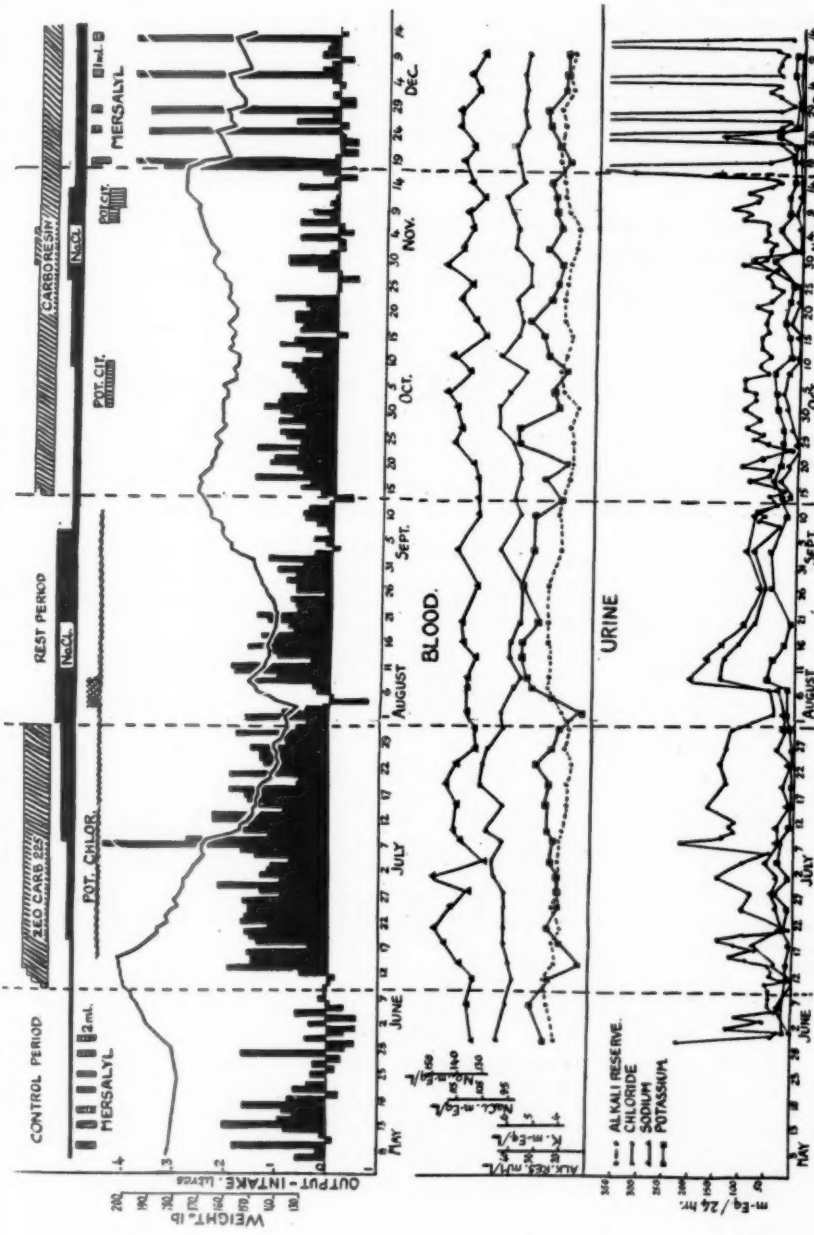

FIG. I.—Main clinical and biochemical findings.

resin (one-third being in the form of the potassium salt), with some anion exchange resin added to counteract the tendency to acidosis. This resin was pleasant to take and did not cause nausea. 72 grammes were given daily for most of this period. The patient's condition remained stationary for the first five weeks, but deteriorated during the next four.

No tendency to hypopotassæmia was noted but the alkali reserve fell to 16·2 mM/L on 1.10.51 and to 17 mM/L on 5.11.51. It rose, however, to normal when potassium citrate was given.

(5) *Carboresin plus mercurial diuretic* (17.11.51–14.12.51): Mersalyl was given at intervals in addition to the resin. The results of this combined therapy are, up to the present, very good. By 13.12.51 the patient had lost 27 lb. in weight and his œdema had cleared up completely. He is now ambulant.

Xanthomatous Biliary Cirrhosis.—THOMAS PARKINSON, M.D., M.R.C.P.

Mrs. B. H., aged 46. No previous jaundice. No family history of jaundice or xanthomatosis.

April 1950: Gradual onset of jaundice, followed by anorexia, loss of weight and itching of skin. Urine became dark and stools pale.

October 1950: Seen as an outpatient; found to be deeply jaundiced. The liver was palpable to the level of the umbilicus and the spleen just palpable.

Liver function tests: Alkaline phosphatase 91 King-Armstrong units; thymol turbidity 27 units; serum bilirubin 4·0 mg.%.

January 1951: The patient complained of severe burning pain in the feet. Examination showed cutaneous xanthomata in the folds of the palms, on the extensor surface of the elbows, and, to a less extent, on the soles of the feet. The liver and spleen were still enlarged.

Investigations.—Serum cholesterol 820 mg.%; alkaline phosphatase 110 units; X-ray of feet negative.

April 3 *to May* 4, 1951: First admitted to hospital. Her feet had become more painful; the pain had failed to improve with foot exercises, vitamin B_1 and nicotinic acid. Examination showed further increase in the cutaneous xanthomata; there was also an increase in cutaneous pigmentation. The liver and spleen were unchanged, B.P. 160/95. No pigmentation of palate.

Liver function tests: Serum cholesterol 1,000 mg.%; alkaline phosphatase 88 units; Takata-Ara negative; thymol turbidity 15 units; plasma protein 7·5 grammes % (albumin 4·8, globulin 2·7).

Laparotomy (Mr. D. Barlow).—Showed a huge congested liver and a firm enlarged spleen. All bile ducts were patent, but the gall-bladder and bile ducts were small and contracted. A piece of liver was removed for biopsy.

Biopsy report.—Proliferation of the smaller bile ducts with cellular infiltration and little fibrosis. Biliary staining is moderate, the normal architecture of the liver is maintained. Sections stained for fat fail to reveal xanthoma cells.

Other investigations.—Prothrombin time 14 sec.; cholecystogram showed a non-filling gall-bladder; serum calcium 10.0 mg.%; plasma phosphorus 3·2 mg.%. Radiographs showed no evidence of skeletal osteoporosis or of xanthomatous deposits.

May to September 1951: The patient was treated with methyl testosterone, 20 mg. daily. There was improvement in the painful feet and diminution of the cutaneous xanthomata: the serum cholesterol fell and the serum bilirubin increased (Fig. 1).

November 1951: Readmitted because of bleeding gums and a large hæmatoma in the right loin. There was immediate response to blood transfusion and vitamin K. The prothrombin time was not estimated until after treatment, when it was normal.

Comment.—This patient has chronic jaundice with hepatosplenomegaly, a high serum cholesterol and cutaneous xanthomata. These features are characteristic of "xanthomatous biliary cirrhosis", and the liver biopsy confirms that the essential change in this case is an inflammatory exudate around the bile passages. Although it was once considered in these cases that the changes in the liver were secondary to the raised blood cholesterol (Thannhauser and Magendatz, 1938) it is now believed that the fundamental lesion is a chronic intrahepatic biliary obstruction caused by a pericholangiolitic cellular process leading to fibrosis, the high serum cholesterol and the xanthomata being secondary to the biliary obstruction (MacMahon, 1948). It is probable that some patients with primary biliary cirrhosis do not proceed to the stage of xanthomatosis (Ahrens *et al.*, 1950). A similar clinical picture may be produced by extrahepatic obstruction. The exclusion of extrahepatic obstruction is notoriously difficult (Sherlock, 1950); it has been carefully looked for in this case but there was no evidence of it.

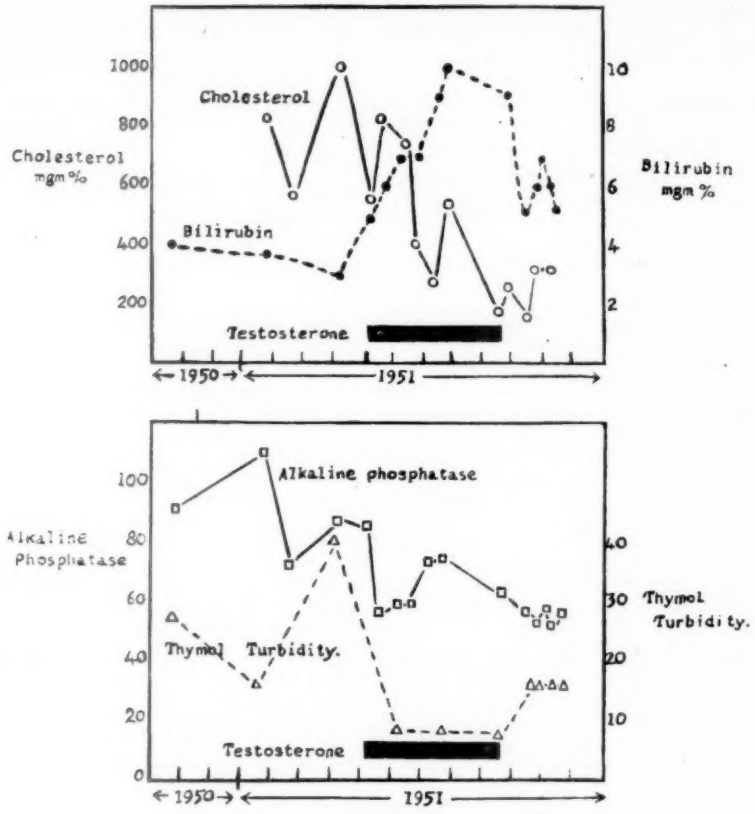

FIG. 1.

The present case showed marked fluctuations in the serum cholesterol levels before treatment was given (Fig. 1). The giving of methyl testosterone, by mouth, was followed by a fall in the serum cholesterol and an increase in the serum bilirubin (Fig. 1). Although this may be coincidental, similar findings were noticed by Ahrens and his colleagues (1950). An unusual feature of the present case is the constant unbearable burning of the feet early in the xanthomatous stage. This symptom disappeared when methyl testosterone was given: it may well have been caused by xanthomatous deposits in the tendons of the feet.

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Dr. Richard B. Terry: The high alkaline phosphatase, the negative Takata-Ara, the apparent response of a hæmorrhagic episode to vitamin K, and the absence of either cirrhosis or xanthoma cells in the biopsy all suggest a diagnosis of intrahepatic biliary obstruction rather than xanthomatous biliary cirrhosis. Further information might be obtained by a search of serial sections of the liver biopsy for bile lakes and, if laparotomy is performed, a cholangiogram.

In spite of the present chemical and radiological findings, the pain probably was due to decalcification, particularly in view of the response to testosterone.

POSTSCRIPT (23.2.52).—The patient has declined further laparotomy.

There has never been (and there still is not) radiological or chemical evidence of osteoporosis.—**T.P.**

Progress Note on Case of Xanthomatous Biliary Cirrhosis.—Shown by W. A. BOURNE, M.D., F.R.C.P., and J. K. WAGSTAFF, M.R.C.P., to the Clinical Section on April 14, 1950. (Reported in *Proc. R. Soc. Med.* (1950), **43**, 894.)

Dr. J. K. Wagstaff: In August 1950 the patient developed considerable œdema practically confined to the right side of the body. Two months later, following a fall, she complained of severe pain in the back and legs and an angular kyphosis and pigeon chest developed.

In March 1951 she had melæna on three occasions. One month later the left tibia and fibula were fractured by slight trauma and X-ray at this time showed gross osteoporosis. In May 1951 the patient died from hæmatemesis and melæna. No autopsy was obtained.

Restoration of a Popliteal Artery by a Frozen Arterial Homograft.—H. H. G. EASTCOTT, M.S., F.R.C.S.

E. C., aged 60.

July 1951: Sudden onset of intermittent claudication in left calf. Also numbness and swelling of left foot. Pulses in right leg were all present but on the left side only the femoral could be felt. Arteriography showed complete occlusion of the upper part of the popliteal artery.

October 10, 1951, *Operation.*—Posterior exposure of left popliteal artery. Excision of 8 cm. which were thrombosed. Insertion of a frozen stored arterial homograft by everting suture anastomosis. No collaterals were interrupted. Distal pulses returned during the operation and have remained since. Heparin given immediately after operation and on first day.

Arteriography.—Fourteenth post-operative day showed graft to be patent and functioning normally.

January 1952: Returned to work as milk roundsman.

Comment:—

This method of preserving arterial grafts by freezing is based upon experimental work in dogs (Eastcott and Hufnagel, 1950). Rapid freezing of fresh tissues minimizes damage from ice crystal formation and low temperature storage prevents chemical deterioration, so that vessels may be banked frozen for indefinite periods.

Boyd *et al.* (1949) found that many patients with claudication have a localized occlusion of the femoral or popliteal artery. Reboul and Laubry (1950) and Forty (1951) have "disobliterated" these vessels with relief of symptoms. It is thought that restoration of function by an arterial homograft may be preferable where stored vessels are available and freezing appears to be the best method for this.

I am grateful to Mr. Victor Riddell for referring this patient after his investigation had shown the site of the lesion.

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Section of Laryngology

President—F. C. W. Capps, F.R.C.S.

[*November* 2, 1951]

Observations on the Treatment of Infections of the Maxillary Antrum [*Abridged*]

PRESIDENT'S ADDRESS

By F. C. W. Capps, F.R.C.S.

Some 200 cases from private records have been abstracted with a view to evaluating the relative merits of the treatments used in infections of the maxillary antrum. These all reflect personal notes, treatment and after-care not always possible in hospital patients although treatment in the latter has been guided by identical principles and experience there gained has been the basis for all my work.

Except for casual cases attending as outpatients or occurring during their stay in hospital the rhinologist is not often called upon to treat cases by medicinal methods. These incipient and acute cases come mostly within the province of the general practitioner. In these days his treatment is usually sound but often frustrated by the refusal of the patient to resign himself to a proper period of confinement to bed, the most important single factor in bringing about early resolution. The loss of the small practitioner hospitals so suitable for this work has been a very undesirable feature of the Health Service. A majority of cases therefore come for consultation after an adequate attempt at resolution and may be said to have reached a subacute or chronic stage.

We would probably do well to recognize, as we have with the acute ear, that a stage of chronicity may be established at an early date. It is almost an aphorism that if you get an antral infection on the first day you will have it well in a week; if the infection has existed for a week, it will take a month and that if it has been present for a month it may take an indefinite time to cure.

All the cases under review have a history of not less than one week's duration and all but a small percentage very much more than that. Many of them did not come until long after the onset and had had no conservative treatment directed to the condition.

I have divided my cases into 3 categories:

Puncture and lavage, 61 cases.

Intranasal drainage, 93 cases (3 from previous group).

Caldwell-Luc, 18 cases (2 from previous group).

Proof puncture with lavage or aspiration has been used for diagnosis or confirmation in a number of cases where it was decided at once that surgical drainage was necessary, but I find that I have 56 cases in which it was the only measure leading to success. Several were cured by one lavage after a history of years. The evacuation of a pent-up yolk of mucopus or residual debris appeared to be all that was required to re-establish normal ciliary activity and a healthy cavity. More frequently a second lavage is performed to make sure that such is the case. Another case required five washouts at three- or four-day intervals after a history of only one week. There is certainly no harm in repeated lavage if it is not too distressing to the patient.

I can remember one case, a nurse, not included in these figures, in whom I performed 11 washouts and finally succeeded. All the early washouts were exceedingly tight, with pretty considerable discomfort and a poor air entry after completion. I was very doubtful of success and urged that we cut short her discomfort by intranasal drainage. She was very averse to any operation and begged me to persist. In the end she won.

Of the 61 cases in my first category 5 were failures. 3 of these submitted to intranasal drainage with complete success. The other 2 certainly should have had further surgery but refused.

One was a case of dental origin who had also had penicillin, the other was a case in which I regretted my attempt at lavage. He had on a previous occasion had allergic polypi which I removed. He returned several years later with considerable polyposis, obviously allergic, in both sides of his nose and with a recent superimposed subacute infection of the antrum on the right. It was my desire to clear the polypi under general anæsthetic and give him proper drainage of the antrum. He had a horror of general anæsthetics and persuaded me to clear the polypi under local anæsthesia. The mucopurulent discharge continued on the right side and we decided to try lavage. The puncture was easy but in no position of the cannula could I get any return flow, only an obstinate pressure which caused acute discomfort. Within forty-eight hours a fierce reaction resulted with a flare-up of the ethmoids and œdema of the inner part of the orbit. Massive doses of penicillin were required to quieten it all down. The patient still refused radical surgery and as far as I know nothing more has been done. Without penicillin this might have been a disaster. As it was it was an unpleasant experience.

In my second category were 93 cases including the three failures from lavage. 4 had had puncture and washout elsewhere. Many, as mentioned before, had a proof puncture to confirm the diagnosis and decide the course of treatment. Either on the ground of their long history or because it was thought

unlikely that they would stand up to possibly a long course of washouts they were advised operation straightaway.

The length of history varied from five days (a case associated with generalized upper respiratory infection and an acute mastoid) to nineteen years. More than half of them had had symptoms for a year or more and many of them for a number of years. 17 had had or still had polyposis and ethmoiditis.

82 were outright and lasting cures.

4 were noted as improved.

2 were outright failures and required a Caldwell-Luc operation a year or two later.

1 improved but the ethmoids still gave trouble.

In 1 a cyst wall was removed complete from inside the antrum and this I have also done occasionally in other cases in hospital when a clear yellow fluid has been aspirated on proof puncture.

In 1 absolute cure trouble occurred in the other antrum some years later and as the X-ray demonstrated a generally thickened lining I performed a Caldwell-Luc on this side. The immediate result was certainly no better than on the first side and there has been a tendency to recurrent infection on that side since.

At least 4 cases were lost to observation before I could satisfy myself that treatment was complete, though in 3 of them improvement was great.

4 cases had ethmoidal polypi which were removed intranasally at the same time, all with success. 7 cases had polypi and frank ethmoiditis; the polypi were removed and the ethmoid gallery drained intranasally. Only 1 of these 7 was a failure and was later subjected to a Caldwell-Luc operation and a trans-antral radical ethmoidectomy.

In my third category I have 18 cases. 2 were failures of my own intranasal surgery as reported above. One of these had extensive ethmoiditis when first seen at the age of 14 and I should have been more radical at the onset. The other was the case where an intranasal operation had resulted in lasting cure on the other side.

5 had had antral trouble for years with histories of puncture and lavage or antrostomies which had failed. In one of these there was a very definite allergic basis.

In 1, a case of Ménière's syndrome, the lining looked very thick on X-ray but on opening was almost normal, and I feel sure an intranasal operation would have sufficed.

In 1 a double Caldwell-Luc was done during my absence on holiday. I had thought the case reasonably under control with an occasional lavage, and had been more concerned by a bilateral chronic suppurative otitis which was clearing up well. In my opinion the nasal condition is still much the same and the ears show no further improvement.

In 7 cases the decision to be radical was prompted by:

(i) A very tight puncture and washout suggestive of gross polyposis (2 cases).

(ii) Long-standing dental sepsis (2 cases).

(iii) Gross ethmoiditis (2 cases).

(iv) A very thickened and obviously polypoid lining on X-ray.

I was surprised to find how high a proportion of these cases had responded to intranasal measures alone, especially as I had been rather wide in my interpretation of suitable indications. However, I was in good company, StClair Thomson and Negus (1948) in their final paragraph on treatment of maxillary sinusitis say:

"We have had excellent results with the intranasal route, even with cases with ethmoiditis, and reserve the Caldwell-Luc operation for cases which have not been cured by the intranasal operation, for those with marked hyperplasia or polyposis of the antral lining, and for some of dental origin and those with retained foreign body. The reasons for failure to cure the patient by intranasal operation may be marked hyperplasia of the mucosa, the presence of a small abscess in the lining membrane, or persistent ethmoiditis."

This sums up my own experience. As it is wellnigh impossible to tell from X-ray or symptomatology what degree of degeneration the mucosa may have undergone I still feel that it might more often be given the benefit of the doubt and I am inclined to dispute the assertions that the intranasal operation is a thing of the past and that one should do a Caldwell-Luc or nothing. It takes a strong-minded surgeon to resist the temptation to remove the whole lining when once he has gone to the length of exposing the cavity through the canine fossa. Surely partial removal is anyhow undesirable. I cannot imagine that a cavity lined by a patchwork quilt, partly scar tissue and partly original untouched mucous lining, can possibly function in a proper physiological way. The ciliary streams so vital for drainage seem unlikely to function in such circumstances. We are told by Proetz and others that if the lining is completely removed a ciliated membrane will regenerate and, assuming the whole surface to be of one texture, one can imagine that drainage might be satisfactory. But Proetz admits that doubts do exist as to whether the regenerated lining can be normal in function, that regeneration is not invariable, and most significantly,

"that normal vigorous ciliary activity usually—in fact, almost invariably—exists within a sinus, even in the presence of overwhelming infection of long standing".

Granted that there may be a high degree of submucous infection and œdema under normally acting ciliated epithelium I still feel that this may be reversible and the less radical operation be justifiable far more often than is supposed.

While stating that any surgery must be as radical as may be necessary Proetz (p. 255) says:

"This, however, does not lessen the necessity for the utmost conservation of function whenever possible and to one's own way of thinking the skill of the rhinologist is directly proportional to his ability to accomplish this. The author has had the opportunity of observing many patients who have undergone all manner of unsuccessful sinus operations. These people come in whenever the weather changes . . . Into their sinuses, unprovided with the glands to cope with it, cold, dry and dusty inspired air is projected with each inspiration. Their squamous linings are in a constant state of irritation, and so are they."

Eggston and Wolff (p. 566) say that whenever the mucosa is removed (in the radical operation) the epithelium may regenerate but there is only a small amount of regeneration of the seromucinous glands.

Another factor seems to be relevant. Anatomically the floor of the antrum with the posterior, alveolar and palatal extensions which often exist may lie well below the level of the floor of the nose in the erect position. The most carefully planned counter-opening into the nose may well leave this area undrained. The only hope of continuous, as opposed to postural, clearance would seem to lie in an intact lining with functioning cilia and adequate mucous blanket, intact moreover right up to the antral ostium which, all are agreed, must remain inviolate in any operation if the ciliary streaming is to persist.

Causes of Failure

The intranasal operation.—Apart from the persistence of an unhealthy lining requiring radical removal the common cause of failure is closure of the fenestration. This I believe most often to be due to an inadequate opening either on account of size, irregular margins, or the formation of adhesions from excessive trauma in the approach. The approach should always be made as easy as possible. Gross septal deformity may need correction to open up the nasal passage or a swollen or hooded inferior turbinal may need to be elevated, reduced by submucous resection of the spongy bone or a small semilune of the anterior end amputated. If the last is carefully performed with turbinal scissors and a snare the scarring is minimal and only a very small piece need be removed to give excellent visual approach to the antronasal wall. I do not attempt to peel off a flap of mocoperiosteum but perforate with a suitable sized Harmer's retrograde antrum chisel and then nibble away the fringe of soft and bony tissues with forward and retrograde biting forceps. The retrograde forceps I use is an Ostrum punch with a slight curve in a universal handle which can be set right or left and at any angle. This slight curve ensures that the forceps work in the plane of the bony wall and there is not the same tendency to slip off hard bone as is likely with a straight end. This punch can deal with upper, anterior and lower margins and any suitable straight forceps will tidy the posterior margin. The margins are then carefully filed smooth with a frontal sinus rasp.

Myles in his description of his operation stresses three important anatomical facts:

(i) The possibility of an antral floor higher than the floor of the nose.

(ii) That the posterior part of the antronasal wall contains the posterior palatine canal with vessels and nerves. The opening therefore must not be far back.

(iii) The nasal opening of the lacrimal duct lies high up and well forward and should be avoided. He advocated an opening some $\frac{1}{2}$ in. to $\frac{3}{4}$ in. in diameter.

Blood clot, mucus or mucopus, and chips are then removed from the antral cavity by suction, exploring in every direction until clear unobstructed "sucking" persists. Isolated polypi can be located by this procedure as they "stop" the sucker end. Thus localized they can be removed blindly by suitable forceps. Bleeding is rarely severe and packing is usually unnecessary. If the middle turbinal is swollen, polypoid, or impacted between the septum and the middle meatus I reduce it with turbinal scissors and snare, removing up to one-third of the anterior end. I still have the temerity to open up and clear infected anterior and middle ethmoid cells intranasally. Forceps with a backward angled tip are useful in the region of the agger nasi cells. If there is any gross general ethmoiditis with antral infection then I prefer a Caldwell-Luc drainage of the latter and transantral removal of the ethmoid disease. I find that I very rarely do an external ethmoid operation these days.

Failure in the *radical operation* is I believe associated with the physiological and anatomical factors I have mentioned, possibly with a persistent osteitis, though unless the latter is associated with dental sepsis or retained roots I doubt much can be done about it. Lastly an allergic factor is often a bugbear.

Method of Treatment

In considering what method of treatment should be adopted and assuming that medicinal measures and confinement to bed have failed I would say that:

(i) In all simple suppuration limited to the cavity of the antrum, or where a generalized infection is probably being kept up mainly by the antrum, I would always favour an attempt at cure by puncture and lavage of the latter. I have no skill at lavage through the ostium and I believe that more trauma may be occasioned than by the puncture approach. There must be reasonable prospect of co-operation by the patient and most children would be excepted on this account. In the acute or sub-acute phases of an infection I would invoke the aid of systemic antibiotics.

(ii) That I would always try intranasal surgery when possible.

Exceptions would be an unduly narrow working space; very gross ethmoidal disease; X-ray

appearances when confirmed by clinical findings, especially when the proof puncture by its tightness or "stopper" action suggests gross intrasinus polyposis. Intrasinus foreign bodies, usually of course a tooth or a tooth root. When a large intrasinus cyst is reasonably certain.

(iii) Radical antrostomy should be reserved for the exceptions named in (ii) or when intranasal surgery has failed.

In 11 cases in which dental trauma or spesis was the only causal factor:

1 was cured by washout through an open socket, the latter closing when the washouts became clean. 1 was improved by the removal of further septic teeth. 5 were cured by intranasal drainage. 2 by intranasal drainage and the removal of septic teeth or roots. 1 by the removal of a retained root after a Caldwell-Luc performed elsewhere had failed. 1 by removal of a tooth from the antrum by Caldwell-Luc approach.

The influence of chemotherapy and the antibiotics, particularly the latter, on the therapy of these conditions has been profound. Treatment of the acute stage may well be said to have been revolutionized and the prevention and control of complications greatly improved.

Penicillin is still our great standby I have not found that local application in the nose has had much effect. As a tablet for the mouth or inhalation for the lower respiratory tract it seems to have a definite place, likewise as a powder in the mastoid cavities, but if certain action in the nose is required I think the administration should be parenteral.

In the case of the maxillary antrum it is always wise to puncture and washout at the end of the treatment. While it resolves congestion and reduces the systemic disturbance it does not always cause the drainage of the sinus contents, and if care is not exercised a pool of material may be left behind as a latent source of trouble later. Except in fulminating cases 300,000 units of Distaquaine morning and evening seems to be adequate and to produce the desired results.

I have found penicillin to be more certain than sulphatherapy. They can, however, be given together and this may be advantageous if there be a penicillin-resistant organism in a mixed infection. The control exerted by both agents in that anxious case the acute flare-up in an old chronic condition, or before and after extensive bone surgery, is most comforting. I am a little concerned lest the impunity vouchsafed may encourage rather too much and sometimes injudicious surgery.

The problem in children requires separate consideration. In 1945 with Gwynne Evans I made a plea to this Section for the formation of Upper Repiratory Clinics for Children. In them it should be possible to attack the trouble while it is in the stage of physiological response and before irreversible pathological change has taken place. To that end it is much better that they be segregated from the everyday clinic to one of their own where special consideration can be given:

(i) To environment and the social factors.

(ii) To regular attendance for observation and conservative treatment.

(iii) To rehabilitation of atonic musculature in the Speech Therapy Department, and correction of orthodontic defects.

It has been found in such a clinic that sinus congestion, and even infection, in children is a very intermittent process. X-rays taken at regular intervals for a year may show alternate clarity and opacity of the antra.

Only in rare instances is this opacity permanent.

I find myself in considerable agreement with Macbeth in the treatment of these children in the early phase. He advocates "nasal soaks" or what I would term postural ephedrine. Replacement therapy may help but I believe that it can be overdone and that regular postural treatment at home will accomplish as much and more. I agree with him that if medicinal measures fail puncture and aspiration or lavage is advisable but only in hospital under general anæsthetic. I have yet to be convinced that I would consent to any child of mine being subjected to repeated puncture under local anæsthesia as an outpatient.

In the chronic case I have tried the intranasal attack and I have tried radical surgery and in both I have met with disappointment. The more recent technique of introducing polythene tubing which is left *in situ* and used for daily toilet, with or without specific therapy, seems to offer better hope of success.

Lastly I must own on the whole to a conservative tendency. The whole history of the treatment of this condition points to the fact that the radical approach is the more antiquated, and that conservatism is the more recent tendency and indicative of progress.

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This paper will appear *in extenso* in *J. Laryng.*

Mr. A. S. H. Walford pressed for an even more conservative outlook. He now reserved the Caldwell-Luc operation for cases of polypi and foreign body in the antrum, or where previous surgery had failed. He believed that even an intranasal antrostomy upset the physiology of the nose, and that treatment by twice daily antral lavage and instillation of antibiotics would effect a cure in nearly all cases of acute and subacute infection, and in many cases of chronic infection. As it was the mechanical washing out rather than the instillation of the antibiotic which was the more effective, he favoured a curved metal indwelling cannula, rather than plastic tubing, which, if introduced through a cannula, was of too small a calibre for efficient flushing out of the antral contents. In Addenbrooke's Hospital now this was the treatment in most cases, and only rarely was an intranasal antrostomy required.

Mr. J. C. Hogg recommended local anæsthesia in making the intranasal opening. Performed like this it was a relatively minor operation, and could even be carried out in the consulting-room. He had found polythene tubing particularly suitable for children, and perfused with isotonic saline solution, rather than solutions of penicillin, twice a day. In very elderly people, who were often edentulous, he recommended alveolar drainage if they were not fit for more radical surgery. A plug was fitted to the denture; they swilled the mouth out once a day with a lotion, some of which returned through the nose, "and they worry the doctor no more".

Professor F. C. Ormerod said that every effort should be made to relieve an acute infection of the antrum by medical means and to postpone antral puncture and lavage until the most acute phase was over. If still necessary, lavage expelled the resultant products of infection and brought the episode to an end. It was of the greatest importance to relieve any obstruction to the normal opening of the antrum. Inflammatory swelling of the mucous membrane in this region could be very satisfactorily reduced by packing the middle region of the nose with gauze soaked in a colloidal suspension of silver and iodine for four hours.

Mr. C. Gill-Carey was in full agreement with the President's conservative approach to the problem. He differed from him in that he preferred the use of general anæsthesia for many minor procedures such as antral punctures, especially as this could be helped by the introduction of plastic tubes to be used for subsequent irrigation.

Mr. Gavin Young said that in his experience the only certain radical removal of an antrochoanal polypus was by the Caldwell-Luc approach. Intranasal removal was often followed by recurrence. This polypus followed an abnormal state in the physics of the antrum, as was shown by the fact that the polyp always presented through an accessory ostium. It was necessary usually to remove only the antral mucosa forming the base of the polyp, the remainder of the mucosa usually being healthy.

Mr. W. A. Mill said that the difficult decision was whether operation was to be undertaken or not. In his experience the Caldwell-Luc operation gave better results and it was an easier operation to perform. He had for a long time felt that if one had to operate one should do a Caldwell-Luc operation. It was interesting to see how the discussion had shaped so far; up till now what he would call the "little-enders" had had the field to themselves. He wished to speak up for the "big-enders".

Mr. Donald Watson said that he agreed with the President's views. He had had bilateral intranasal antral drainage twenty-three years ago. Because he used vaccines regularly he rarely caught colds but if he did, the antra immediately lit up and discharged very freely.

Nasal douching soon cleared them up and he believed that some penicillin in the douche helped.

He rarely did the Caldwell-Luc operation. He would do it on the small antrum as had been mentioned by Mr. Hogg as he believed the thick walls were due to osteitis.

Mr. J. J. Biber said that, having been trained by Hajek, he always followed the rules laid down by him. Systematic antrum lavage twice or three times a week had given satisfactory results in most of his cases—sometimes amazingly good when sulphonamides or penicillin had been instilled. He had a lurking fear we might be just a little too eager to perform antrostomies. Only when 15 or 16 washouts gave no result did radical operation become necessary.

He wished to remind the meeting of Sturman's operation which was more physiological than the Caldwell-Luc and gave ample exposure of most of the antral walls. He gave details of this operation.

Mrs. F. Cavanagh said that she performed antral washouts on children of 4 or 5 under local anæsthesia. The nose was not packed with gauze but a fine cotton-tipped Tumarkin probe was dipped into cocaine and adrenaline and slipped under the inferior turbinate with very little discomfort. If much pus was present polythene tubing was passed through the antral cannula and left in the antrum for daily washouts. Children were apt to pull tubing out of the nose and this was avoided by applying plaster of Paris splints from the mid-arm to the mid-forearm which prevented flexion of the elbow.

Mr. F. A. MacLaughlin (N. Ireland) said that they had a wide experience of antral infections complicating the common cold. He also was a sufferer from recurrent colds and antral infections, but these had been markedly reduced in frequency by a submucous resection of the septum alone. His own antrum often served as a useful barometer to indicate overwork. In examination and diagnosis of antral infections, reliance was placed on transillumination, proof puncture, with bacterial examination of sample of contents, including sensitivities, and X-rays.

If the organism was found to be sensitive, infection cleared up rapidly when penicillin was used locally in the antrum, and systemically.

Mr. C. A. B. Horsford related a personal experience in New York, where, having caught a cold, he was treated by the washing out of the antrum every other day. This, he found, did him good and he recommended it to his colleagues in London on his return. The washing out, which should be done on both sides, had proved a complete success.

After he returned to London he had had internal antrostomy performed. This had been a permanent success both as to his health and the ease of washing out the cavity with a cannula.

The President thanked the Meeting for a fruitful discussion. He realized that he had been fortunate with intranasal clearance of polypi and he was quite sure some would regard a radical operation in such cases to be essential. Mr. Mill preferred to do his antral fenestration through the antrum, but the President felt that a Rhinologist who could do a good intranasal antrostomy might create less disturbance. He was relieved to hear that the lining remained inviolate, but he still thought the temptation to consider it pathological might be great.

Much depended on domiciliary care—changes of temperature were to be avoided by staying in bed. Decongestants should be physiological: ephedrine in normal saline and medicated steam did a great deal of good. In fulminating cases, antibiotics could be given at the start, but he did not make it a rule to use them in all cases, it seemed to be unnecessary.

Mr. Hamblen-Thomas had drawn attention to the value of general and climatic treatment. It is certainly wise, if not essential, for a patient to have a reasonable period of convalescence before returning to work.

[*December* 7, 1951]

DISCUSSION: THE ROLE OF THE GENERAL PRACTITIONER IN OTORHINOLARYNGOLOGY

Mr. Myles L. Formby said that the importance of collaboration could not be overemphasized. General Practitioners to be properly equipped must, as students, be encouraged to examine E.N.T. cases and, as postgraduates, be provided with special clinical instruction. The tendency to assess the patient as so many units, each in a separate department, must be avoided.

The introduction of antibiotics made otolaryngology more medical and less surgical. While it was necessary to have some knowledge of the clinical features of E.N.T. diseases, it was essential to know the dangers of administering therapeutic agents incorrectly. The speaker quoted an instance of a general practitioner who "saved" a child from myringotomy only to inflict a severe degree of permanent conductive deafness.

The most important part the general practitioner played was in his intimate knowledge of the patient so that he saw him as a composite individual and thus the general practitioner was in a position to give guidance to the specialist.

Examples of general disorders producing local nasal symptoms were instanced by Mr. Formby. The value of co-operation in psychiatric, allergic and incurable cases was stressed.

Miss Josephine Collier discussed the role of the family doctor, namely diagnosis and treatment of those diseases which do not require the special facilities of hospital, i.e. conditions which can be treated in the general practitioner's consulting room or the patient's home. Much dissatisfaction in general practice nowadays was due to the tendency for clinical activities to be limited. But chemotherapy and antibiotics by altering the tempo of acute infections of the ear, nose and throat without lessening their incidence or diminishing the importance of complications demanded accurate day-to-day observation and ability to interpret minimal changes in physical signs. Here the family doctor's role was paramount. The training of medical students should be directed to teaching the handling of instruments that could be used to recognize these physical signs.

The head mirror and reflected light, essential for the otolaryngologist, could seldom be used in general practice. A head lamp was adequate for examining the nose and throat and had the advantage of leaving both hands free for cleaning ears, while an electric auriscope could be used for detecting abnormal otological appearances provided the ear had been properly freed from wax or discharge.

The training of the medical student in otolaryngology should be more precisely integrated into his general medical education. The concept of "specials" with its attendant eponymous tests and instruments should be abandoned. Students should be taught to appreciate physiological and pathological processes and to consider disease in one organ in relation to the whole organism. When these principles were not recognized the use of antibacterial drugs might be misguided; mastoid suppuration would be missed because pain and tenderness were absent though persisting deafness and œdema in the depth of the external auditory meatus should suffice for the correct diagnosis; most important and sometimes disastrous: the treatment of unexplained pyrexia with antibiotics without a preliminary examination of the ear. Miss Collier referred to recent experience of two such instances where there was fatal lateral sinus thrombosis and cerebellar abscess. Since the general practitioner had to treat many symptoms and minor ailments seldom seen in teaching hospitals he needed a proper understanding of physiological processes, e.g. the function of the ciliated mucous membrane of the upper respiratory tract and the part played by nasal mucus. Thus equipped he would escape the error of diagnosing all nasal symptoms as sinusitis to be treated with antibacterial or vasoconstrictor drops but would correctly judge the trouble as due this one to allergic, that one to atrophic or anæmic disorders.

The family doctor's part in assessing the importance of symptoms was required particularly for the early diagnosis of malignant disease, as in the onset of unilateral nasal obstruction or unilateral epiphora, and the persistence of hoarseness, all of which called for specialist examination.

Miss Collier hoped that E.N.T. house appointments would be recognized for pre-registration posts when these were compulsory as she was confident that a proper understanding of ear, nose and throat diseases would be useful for the future general practitioner. Other speakers agreed with this view and two doctors reported independent calculations that between 40% and 50% of their patients required examination of the upper air passages.

Dr. J. P. Kies said that re-examination of a large number of children on a waiting list for tonsil and adenoid operation revealed that in many cases operation was unnecessary, especially when the condition was one of nasal catarrh or allergy, when non-operative measures such as breathing exercises and ephedrine replacement treatment should be tried.

The use of ephedrine drops in the erect position with the head tilted back was useless, and the correct technique with the patient lying down with the head over the end of a couch should be instructed.

Instillation of drops in cases of otorrhœa should be preceded by careful aural toilet, best carried out by syringing the meatus with a small rubber ear syringe and saline or boracic lotion, followed by dry mopping.

Dr. H. A. Ware described the development of the Ear, Nose and Throat Department in a provincial hospital with a general practitioner staff over the last twenty-five years, leading to the establishment of a part-time general practice and part-time E.N.T. surgeon appointment. As areas of the type described are economically unable to support an E.N.T. surgeon who does no other work, it is possible that appointments of this type can ensure that the E.N.T. work is covered by a surgeon resident in the district.

He further discussed the difficulties general practitioners suffer from in dealing with otolaryngological cases:

The practitioner's major difficulty is in making an accurate diagnosis. This arises from two main causes, lack of time leading to a more superficial survey of the upper respiratory tract than is usual in a consultative clinic, and an imperfect diagnosis due to lack of detailed knowledge of the anatomy of the ears, nose and throat and inadequate diagnostic equipment. He pointed out that the teaching he received in otorhinolaryngology as a medical student was all too short to cover the wide field of cases in that category met with in general practice.

Dr. J. D. Simpson spoke of the very large number of ear, nose and throat cases which occur in general practice. Approximately one-third of all the cases that he saw required some form of ear, nose and throat examination. He spoke of the difference between the equipment of the general practitioner and the specialist, and stressed the value of the electric auriscope. He then reviewed some of the common types of cases which occur and considered the indications for referring the child with infected tonsils to hospital, and when a colleague should be called in to see an inflamed ear drum. He spoke of the association between sinus infection and lower lobe collapse of the lung and referred to two cases of mononucleosis which had produced deafness due to eustachian block. He described the method he and his colleagues used for the treatment of cauliflower ear and showed slides of a clip which can be applied after the hæmatoma had been evacuated.

The President said how valuable he felt the contribution of the Members of the Section of General Practice had been. He felt that one of the most important roles of the general practitioner was to teach consultants when they were making mistakes. He stressed the importance of interesting the newly qualified doctor in ear, nose and throat work and he hoped that the discussion would show that some special knowledge was of great value.

In the **subsequent discussion** in which many Members of both Sections took part, the importance of training in E.N.T. work was again stressed. In qualifying examinations of certain Universities questions on otolaryngology were often included, but this was not the case with all. It was felt that the inclusion of questions in examinations would stimulate an interest in the work amongst students.

It was realized that it was impossible to teach students all about otolaryngology in a few months. The opinion of an Edinburgh colleague was recounted. He thought it best to teach the normal appearances of the tympanic membranes, the nose, the larynx and pharynx, so that practitioners could refer a case for specialist's advice if they saw anything abnormal.

The value of the opinion of the family doctor in deciding which cases in children should be submitted to operation for removal of tonsils and adenoids was pointed out by several speakers. The question of treatment of otitis media was raised and while some were in favour of early treatment with antibiotics and sulphonamides, others were more in favour of not rushing to antibiotics. The importance of making sure in any case of otitis media that the hearing returned to normal as the case got better was mentioned. Anticatarrhal vaccines were found to have been of value in the treatment of children.

Throughout the discussion emphasis was laid on the value of collaboration between the consultant and the general practitioner in the treatment of their patients.

LIST OF BOOKS RECEIVED FOR REVIEW

(As no reviewing is undertaken in the "Proceedings" this list is the only acknowledgment made of books received for review.)

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United Services Section

President—Sir GORDON GORDON-TAYLOR, K.B.E., C.B., F.R.C.S.

[*December* 10, 1951]

DISCUSSION ON EARLY SURGERY IN THE FIELD

Professor F. A. R. Stammers: The finest account of "sepsis and its control" is to be found in the History of the Medical Services of the 1914–18 War [1], yet by September 1939 that work was out of print and all the lessons of the First World War had to be re-learned. Surgeons of World War I discovered by painfully acquired experience that it was necessary to lay wounds wide open, to remove all foreign material that was readily accessible, especially in-driven pieces of clothing and equipment, to incise deep fascia as a decompressive measure, and to avoid packing and stitches. By 1916 such men as Henry Grey, Rutherford Morison and Carrell [1] were performing secondary sutures, and pioneer work was being done for belly wounds. Shaw Dunn and McNee [1] showed that gas gangrene was a specific infection of devitalized muscle, thus indicating the need for removing all dead muscle, whilst Sinclair [1] insisted on the splinting of limbs for all major muscle wounds, even in the absence of fracture. Later on, the time-factor was appreciated, and medical organization was directed towards getting the patient to the surgeon within eight hours of wounding. By 1917, when the War was at its most static phase, delayed primary suture and even primary suture was being employed. Yet there were no sulphonamides, no antibiotics, and no readily available blood; surgeons relied on the antiseptics of the day.

All these conclusions were confirmed by our own experiences in the Second World War, and these have been summarized in the Field Surgical Pocket Book [2] of which a second edition has recently been published; it is in adequate supply for all to possess who may be called upon to treat wounded men in the field.

The reason why the accounts of surgery in two major wars are so alike and the same mistakes were made at the beginning of each is that the background against which the surgeon has to work is the same in any war, and utterly different from the conditions of civilian practice; and it is an accurate assessment of the circumstances of the moment that best guides the surgeon.

Some of the Fundamentals of War Surgery in the Field

I. *The Wound*

(1) Every war wound is heavily contaminated. The organisms remain relatively superficial for about eight hours and then penetrate more deeply, leading to infection. This short period is an important time-factor.

(2) In-driven clothing or equipment is highly infected and is more dangerous than the metallic fragments of the wounding agent.

(3) Some product of devitalized muscle is absorbed into the circulation and causes profound and maintained depression of blood pressure.

(4) Gas gangrene is a specific disease of dead muscle. The only means of preventing the development of fully-established toxæmia is to excise the dead muscle at the earliest possible moment.

(5) The chief cause of shock is blood loss, but it is aggravated by pain, exposure, starvation, and the absorption of products of dead muscle.

II. *Environment—Climate, Terrain, Type of Warfare*

The man fighting in the dry sand of the desert, clothed only in shorts and open shirt, will have far less contamination of his wound than the man in winter, wearing half a dozen thicknesses of clothing soaked in the liquid mud of the highly cultivated soil of North Africa or France, and the effects of subsequent exposure on the latter are likely to be more severe. Cold climate will also introduce the complications of immersion foot and frost-bite. Communications also depend on climate and terrain. The problem of the desert was enormous distances; that of Burma was the jungle and no roads at all; in Italy, all bridges were destroyed, and, from time to time, the rains converted bull-dozed tracks into impassable quagmires. Again, the management of battle casualties will have to vary according to whether the fighting is static or mobile, and, if the latter, whether in advance or retreat.

All these things have great influence on the time-factor, upon which the fate of wounds depends so much.

III. *The Time-factor*

If a wound requires surgical treatment at all it needs it at the earliest possible moment. Contamination becomes infection after six to eight hours, and organization should aim at getting all wounded men to a surgical centre within that time. There are a few wounds in which an hour or two make the difference between life and death: open pneumothorax, major muscle wounds (thigh, buttock, axillary muscles), and those of the abdomen with internal hæmorrhage.

The Receiving Officer should not accept so many high priority cases that some have to wait perhaps many hours before they can be treated: those fit for further evacuation should be sent to the next Surgical Centre down the road. For similar reasons, low priority cases should be sent farther back if the more Forward Centres are busy; they will receive earlier treatment in this way. When, because of some temporary road block, there is long delay in reaching a Surgical Centre, it is worth sending forward to a Field Ambulance a surgical team for the very highest priority cases, but with instructions to deal with these alone—since, if tempted to undertake more, a single team would become fatigued and inefficient. If the block lasts more than twenty-four hours, a second team would have to join the first.

IV. *The Trauma of Ambulance Journeys*

An ambulance journey is liable to tear on a man's wounds and, indeed, is a traumatizing event. That is why stitches and ambulance journeys are incompatible, and unsplit plasters are dangerous. Patients must be inspected by the ambulance orderly at frequent intervals, and water and food should always be carried.

When one considers all these uncontrollable variants one can see why surgical opinion concerning the treatment of wounds is not always unanimous. The following is a good example:

The satisfactory behaviour of wounds in the desert made 8th Army surgeons believe that the sulphonamides were largely responsible, and that so effective were they that wounds could be treated less drastically; indeed, they regarded the "excisions" of the First War as being something in the nature of mutilations, which had become no longer necessary.

The 1st Army surgeons, some of them with memories of the "phoney" war in France, working in the cold and wet of winter in North Africa, found that excision was as necessary as in Flanders in 1914–18. The two Armies met on the cultivated soil of Sicily each with preconceived ideas born of their individual experiences. But it soon became obvious that a "snip and trim" policy was of no avail in this new terrain and climate—excision became the rule.

It is environmental circumstances that really dictate what ought to be done, and the appointment of a Consultant to Forward Areas who can move about among all units having anything to do with the management of battle casualties is probably the best way of co-ordinating all. He would be responsible for:

(1) Liaison between Collecting Units, Resuscitation Centres, Surgical Centres, Air Evacuation Check Point, Forward and Base Hospitals, and the appropriate Headquarters.

(2) Watching the time-factor, noting particularly instances of delay in getting patients to Surgical Centres.

(3) The avoidance of overcrowding.

(4) The efficiency of the first-aid in Field Ambulances, especially splinting, over-morphinization, absence of under-blanket on stretcher, &c.

(5) Checking any tendency at Resuscitation Centres to spend too much time on resuscitation rather than on getting the patient to a Surgical Centre as soon as possible.

(6) Visiting Base Hospitals to hear any criticism of the work of any group.

(7) Collecting and disseminating technical information and ideas.

Some Practical Points

(1) *Blood, plasma and other fluids in the field.*—We must continue to rely on clinical judgment in deciding what and how much to give a man in order to restore his physiological balance, remembering, as Grant and Reeve [3] point out, that blood loss is always considerably greater than at first suspected.

(2) *Sulphonamides and antibiotics* are valuable adjuncts but no substitute for adequate surgery.

(3) *Treatment of the wound* in Forward Areas is to save life and limb, and to render it fit for suture four to six days later. This suture achieves skin-cover at the earliest possible moment, i.e. when the patient has been moved to a Centre where he can be held until healing is complete. The advantage of early skin cover is that it prevents the formation of granulation-tissue and, therefore, of scar-tissue with all the tethering and adhesions caused thereby.

Having treated any shock, the surrounding skin is washed with soap and water and shaved, and then cleaned with C.T.A.B. or a similar mild antiseptic.

No more of the skin than the frayed pulped edge is removed; it is precious material and remarkably viable. Tags of fat and fascia and any dirty patches of either are removed. Incisions are made longitudinally into deep fascia as a decompressive device, and also to permit of retractors being inserted to the depths of the wound for full exploration. All muscle that does not bleed or contract when cut with knife or scissors is removed, and any readily accessible foreign material, particularly pieces of in-driven clothing, is taken out. The wound is then insufflated with penicillin-sulphonamide powder. No packing and no stitches are used, but the wound is covered with dry gauze. In the case of fracture, loose pieces of bone are, unless badly soiled, left to be incorporated in future callus formation. Abdomens, major fractures, major muscle wounds and penetrating knee-joints all receive parenteral penicillin for three days. Fractures are, of course, splinted, usually with plaster of Paris, but so also are major soft tissue wounds, the joint above and below being immobilized. Extension should be used for fractures of the femur and for penetrating wounds of the knee-joint: it is important that this be kept effective by adjusting the Spanish windlass at the various staging posts. The Tobruk splint and the thoraco-brachial plasters should be mastered by all. All other plasters must be split or even bi-valved in order to render them free from danger during evacuation. It is important to leave fingers and toes free in order that stiffness may be avoided.

Special Wounds

(1) *Amputations.*—Use anterior and posterior flaps. Do not stitch these, and do not turn them backwards. A plaster cap for the stump protects it during transportation.

(2) *Chests.*—These wounds require full excision just as any other wounds, even if by so doing one finds oneself in the thoracic cavity. It is especially important to remove fragments of rib. The chest is closed hermetically by stitching muscle with catgut: the skin is left unstitched: 50,000 units of penicillin solution are instilled into the cavity. During the following days it is essential to examine daily for, and to aspirate, any hæmothorax. By these measures we reduced the empyema rate from 37% in North Africa to under 5% during the last battles in Italy.

(3) *Vascular injuries.*—I think all surgical units should be provided with arterial needles, vitallium arterial tubes, and heparin.

Training of the Young in Military Surgery

During the compulsory year of hospital residence about to begin, it might be a good thing to give a few lectures to the younger Housemen on the environment of war and its influence on medical practice in the Army. The Registrar grade are the ones most likely to benefit, and for them we propose a short course of lectures from those of us who had experience in the recent War.

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3 Grant, R. T. and Reeve, E. B. G. (1951) *Spec. Rep. Ser. med. Res. Coun.*, No. 277.

Sir **Arthur Porritt:** The difficulties of training a war surgeon without actual field experience are many. So much depends on the individual—his previous experience, his confidence and enthusiasm, his temperament, and his ingenuity.

Certain basic training is, however, possible and should be instituted—preferably in the immediate post-qualification pre-registration year. This should take the form of:

(1) Lectures (by war-surgeons of experience) on: (*a*) A simple plan of a surgical administration set-up in a theatre of war; use of various types of surgical units; importance of link-up between administrative and clinical set-up to fit in with overall-tactical plans (hence the importance of a consulting surgeon(s) in a Force).

(*b*) The facilities available in and methods applicable to war surgery as compared to civilian surgery.

(*c*) Obvious errors to avoid, e.g., unsplit plasters, primary suture of wounds, guillotine amputations, mistaking gas gangrene cellulitis for gas gangrene septicæmia.

(*d*) The relative priorities of wounds with particular mention of the massive flesh wound and serious burn.

(2) Demonstrations, wherever possible, of (*a*) ex-Service patients, e.g. amputees showing results of wounds and the surgery thereof, and (*b*) civilian traumatic cases which might exemplify problems comparable to those of war wounds.

It is important to give young war surgeons training in base areas before allowing them to operate forward. Surgical man-power should be increased in many units in order to avoid overlong operating sessions (this applies also to blood transfusion officers) and the interchange of base and forward surgeons both on visits and as postings is of the greatest value.

In the treatment of abdominal wounds the following points are stressed:

(*a*) Multiple sutures of small intestine wounds are, wherever it is at all practicable, preferable to resections.

(*b*) Exteriorization of the wounded large bowel has saved innumerable lives, but, in the right colon, judgment is very important and suture can occasionally be used to advantage.

(*c*) Wounds of the liver and kidney can very often be treated conservatively but, in general, the wounded spleen is better removed.

(*d*) A wounded bladder is a bladder to be drained.

(*e*) A retroperitoneal hæmatoma is a lesion of serious significance.

Mention was made of the value of intestinal intubation and intravenous therapy together with the administration of the antibiotics and sulphonamides—it being stressed that all these were of secondary importance to sound primary surgery.

Mr. St. J. D. Buxton: Although it is uneconomical to employ orthopædic surgeons in the field, it is important for them to appreciate the work that is carried out in forward areas.

Skin cover means that the wound is closed by some method; it may be primary, delayed or secondary suture or by some form of skin graft. For bone work the sooner skin cover can be provided the better; briefly the conversion of an open fracture into a closed one should be the surgeon's aim. Early closure under tension is not helpful, as a "broken down" closure takes long to heal and infection is frequent. Early skin cover was appreciated during the First World War and secondary suture employed, usually after Carrel-Dakin irrigation. Now, early surgery and systemic antibiotics enable more wounds to be closed.

The same principle should be employed in amputations. The guillotine amputation provided the worst example of loss of skin cover. Hence some flap or secondary suture should be kept in mind.

As the surgeon who does the primary operation rarely has the opportunity of closing the "treated wound", another will carry out the closure. This "combined operation" will be most successful if there is contact between the group of surgeons concerned.

Bone fragments.—In the field, loose pieces of bone are better left in the wound, unless greatly separated and dirty. Removal of large pieces is most uneconomical, as it makes little difference to the wound healing, but pseudo-arthrosis is frequent and bone grafting is required later. On the other hand, these broken pieces, if left *in situ*, act as excellent bone grafts and union proceeds well.

Amputations.—In field surgery, it may be difficult to decide whether to do a formal amputation or to amputate at a lower level. It is noteworthy that a disarticulation at the knee-joint may be fitted with a prosthesis; a long thigh stump or 8 in. leg stump is troublesome. A 3½ in. or shorter leg stump leads to complications and fitting is seldom a success.

"End Results" of war surgery can be studied at Roehampton and clinical instruction there would benefit trainees in military surgery.

Splinting.—Simplicity is advisable. Speed and skill in application, comfort for travelling, and padding to prevent pressure sores, as well as limb immobilization, are required.

The Tobruk plaster is simple to apply, easy to take off, and patients travel well for long distances. Many of our American friends favour the hip plaster spica, but it is cumbersome and not easy to apply, while the loss of heat by the patient's body during its setting may be detrimental. The space required in the ambulance, train and aeroplane make it unpopular with patient and orderly. This is equally true of the arm spica.

It is advisable to split the whole length of every plaster splint applied in a forward area by one or more cuts, as soon as the plaster is applied. If the opening appears wide, a cotton bandage can be put round.

Great discretion is required in the evacuation of a wounded man when a limb is in plaster and the condition of the toes shows there is circulatory disturbance.

Lt.-Col. J. C. Watts: I have lately returned from Japan where a British General Hospital is dealing with the British Commonwealth casualties from Korea.

Surgeon Commander R. M. Latta's paper (1951, *Lancet* (i), 228) described the casualties in the first phase of the campaign, when a rapid retreat was in progress, and, as we all know, in retreat it is difficult, if not impossible, to put into practice the ideals of forward surgery.

From the time of our arrival in November 1950, up to my departure in July we had received over a thousand casualties, with only three deaths, and the forward surgery, mainly carried out in American medical units, was in accordance with the principles already enunciated, with the occasional exceptions where primary suture, tight packing or inadequate incision had been performed, fortunately without any disastrous effects because of the rapid and comfortable evacuation to Japan.

Air evacuation was used extensively in Korea, enabling much earlier and more comfortable evacuation to hospital facilities in Japan; many abdominal wounds were evacuated only four or five days after wounding, a period which most of us would regard as too short, but they arrived safely.

The problems of War Surgery are those of traumatic surgery complicated by "Logistics", that is to say, considerations of time, space, and supply.

The over-riding consideration is usually the necessity for evacuating the wounded from the forward areas, and this modifies our procedures, as stitches and ambulances are incompatible.

I would rather regard delayed primary suture as one operation, with a pause in the middle of from one to five days to allow the patient to be evacuated; the forward surgeon excises the contaminated wound, leaving a clean surgical wound, which is covered with an occlusive dressing and sewn up by the rearward surgeon.

Plasters are invaluable for the transport of wounded, even in the absence of fractures but I would point out that simply to split a plaster does not necessarily relieve tension, and it is preferable to bi-valve the plaster and maintain it in position with a bandage. Peripheral vasodilator drugs certainly may save skin but this may be only at the expense of deeper tissues.

In training Forward Surgeons I feel that they should, if possible, spend a short time at the Base Hospital seeing the arrival of convoys and the difference between good and bad forward surgery, also they would appreciate the need for good note-taking, as informative notes on the field medical cards can save much time and eliminate unnecessary interference.

[*See also Lancet* (1951), i, 526, 747.]

Lt.-Col. J. A. MacDougall: My experiences, lecturing on Military Surgery at the Royal Army Medical College, have shown that the newly qualified and post-graduate students have no knowledge of delayed primary suture. The necessity of exteriorization of wounds of the left colon is not understood. That internal fixation of compound gunshot wound fractures is disastrous even with adequate surgery and antibiotic therapy is not realized. The use of Tobruk and thoraco-brachial plasters is unknown. Reflection causes one to ask whether we are forgetting the lessons so lately learned. Will we, at tremendous cost, have to re-discover these and other principles at some later date?

Lt.-Col. R. A. Stephen: The efficacy of active and passive immunity against tetanus was very clearly illustrated by the occurrence of only one case of tetanus in my experience in the Middle East amongst military personnel, although I treated many cases amongst the Arab camp followers. The soldier concerned had persistently refused all prophylactic inoculations on religious grounds. All his wounded comrades had been inoculated.

Professor C. G. Rob: The Field Surgical Pocket Book contains a list of first priority wounds. In my opinion wounds which interfere with the airway should be included in this list. The report of Grant and Reeve [1] of the M.R.C. Shock Team is now available and they record much that is of interest to the forward surgeon. In particular, two points merit special attention, first that we under-transfused our patients in the last war and second that we gave too little intravenous sodium chloride post-operatively to our abdominal wounds.

REFERENCE

1 Grant, R. T., and Reeve, E. B. G. (1951) *Spec. Rep. Ser. med. Res. Coun.*, No. 277.

Mr. Geoffrey Parker emphasized the importance of the time-factor in the case of abdominal injuries and, not less, the tremendous effect on the morale of troops going into battle of knowing that surgery is ready for them, and at very close range, if they get injured.

He deprecated the use of blood and plasma farther forward than the point at which major surgery was available, except in the case of severe burns.

Mr. Guy Blackburn said that he felt it essential that a forward surgical unit should have two surgeons, and, if possible, that unit should be combined with a transfusion unit.

Mr. Patrick Clarkson: *Prevention of suffocation in wounds of the face and jaws.*

In the transport of these patients I agree with Sir Harold Gillies' suggestion as to the issue of label on which should be printed: "If I can see Heaven, I shall soon be there." There is grave and acute danger in letting these patients lie on their backs during evacuation. The patient who is unconscious from whatever cause, is in special hazard. The indications for tracheotomy are: on wounds of the jaws associated with injury to the larynx or pharynx: when the nasal airway is blocked and the jaws are fixed together by intermaxillary fixation: and at any time when the adequacy for jaw fractures or the post-operative supervision or arrangements in wards, tents, or during evacuation is in doubt. It is particularly important to do a tracheotomy when shock from other major injuries is present and there is any degree of respiratory obstruction due to a jaw fracture. It is clearly better to do too many rather than too few tracheotomies. In the late care of over 50 patients with jaw wounds for whom a tracheotomy had been done (in a variety of forward conditions), I saw no late complications of any consequence; but we had one fatal early hæmorrhage caused by the tube eroding a high division of the innominate artery. I am indebted to Mr. J. Schorstein for references in the literature of other reports of similar accidents following low tracheotomies. Because of the risk of this complication, a high tracheotomy should be the forward surgery routine. Under conditions of the greatest urgency, and then only when the tube will not have to be left in for more than a few hours, a laryngotomy may be done.

Suffocation in burns.—Severe burns of the face and neck sometimes need an urgent tracheotomy. The indications for this treatment in burns are: respiratory difficulty of any sort combined with evidence of scorching or burning of the palate, especially if the source of heat has been steam, and especially if there is also any œdema of the subcutaneous tissues of the neck. The relief produced by tracheotomy in such cases, even when there is associated damage from steam of the lung parenchyma, is dramatic. The tube also makes it possible to clear trachea and bronchi by suction, if necessary, which it often is.

Major-General Sir Ernest Cowell: In the 1914–18 War, early surgery as such was unknown. Surgeons were forbidden to operate on abdominal wounds until 1915, when a Forward Surgical Centre was set up for the battle of Loos. Two surgeons were available and in six hours, 300 cases were awaiting operation!

Subsequently, the value of early operation was recognized and Advanced Surgical Centres were established with, eventually, a recovery rate of 50% for abdominal cases.

In 1940, when fighting began in the B.E.F., there was a lamentable dearth of surgeons. In the rapid retreat only a small percentage of cases could be operated on and patients with abdominal wounds died.

As a result of the Hartgill Committee, of which I was a member, the Establishment of Field Medical Units was reorganized and Field Surgical Units were formed; at the same time a second team was added to the C.C.S.

When I went to North Africa as D.M.S. in 1942, I found 19 F.S.U.s available for the casualties of 20,000 troops. This was a delightful contrast to the position in Flanders in 1940, when as D.D.M.S. 3 Corps, I had three teams for 75,000 men!

The establishment of Advanced Operating Centres, with Nursing Officers and Field Transfusion Units attached, enabled early surgery to be performed to the maximum. Patients with severe wounds who would have died in R.A.P.s or A.D.S.s under the old conditions, were treated often within less than two hours and a recovery rate of 75%, or over, was obtained.

A warm tribute should be paid to the gallant stretcher-bearers and R.M.O.s, who by their devotion, gallantry and skill rendered efficient first aid, including transfusion, and carried out rapid evacuation, thereby making the success of early surgery possible.

Mr. W. A. Law: In this discussion the emphasis on the requirement for the Forward Surgeon has been on his youth, whereas I am of the opinion that experience is the prime requirement, and that the judgment and decisions that have to be made in the Forward Area demand the skill and experience of a mature surgeon. There are many surgeons of the required maturity who are sufficiently fit physically to carry out the work in the Forward Area, who are of full Consultant status, both in age and experience. I am in perfect agreement with the other speakers on the principles of early wound toilet and delayed primary closure.

Mr. R. S. Lawrie: The need for specialist teams such as the Head, Face and Eye teams arises partly from the necessity of provision of special equipment for them and partly from the different tempo of their work. It is administratively difficult to have a unit dealing with relatively quick operations on limb wounds, and also with operations taking two hours or more on the head, face and eye.

This must be borne in mind in planning to provide forward surgical units with arterial grafts and provision for other delicate and highly specialized operations.